HANDY BOOK FOR YOUNG FARMERS.

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A

HANDY BOOK FOR YOUNG FARMERS

COMPRISING

OPERATIONS FOR EACH MONTH IN THE YEAR;
DIRECTIONS FOR THE MAKING, PRESERVATION, AND APPLICATION OF MANURES;
FOR THE ECONOMICAL FEEDING OF STOCK; AND
FOR THE SELECTION OF IMPLEMENTS.

BY CHARLES LAWRENCE
MEMBER OF THE COUNCIL OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

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HANDY BOOK FOR YOUNG FARMERS.

INTRODUCTION.

At the commencement of our agricultural career we experienced great difficulty in procuring the various information we required from farmers, in a definite and useable shape. We did not attribute this to any disinclination to impart knowledge, but rather to their desultory mode of proceeding, and the absence of that well-defined system of management, the result of careful observation of the results of experiment, which enable a man to state his views with confidence, and the reasons on which they have been founded.

With such information as we had derived from personal attention to garden culture for several years, some knowledge of vegetable physiology, and with but a superficial acquaintance with sciences bearing more or less on the routine of agricultural practice, we resolved to work out our own experience. This has been materially aided during the last twenty years by the continual development of science in its application to agriculture. At the period to which we have referred, the bare mention of science was treated by the farmers

of that day with something like contempt. "What," said they, "has science to do with farming? That is to be learned only by practice and experience." We admitted, to the fullest extent, the advantages to be derived from practice and experience; but it must be borne in mind, that while experience is nothing more than the observation of facts and the remembrance of them, it is barren of intelligence as to the *why* and the *wherefore;* and that Aristotle observed more than 2000 years ago: "To know and to understand belong rather to *science* than *experience;* and we think that the scientific are wiser than those who derive their knowledge from experience only, because in all men wisdom springs from knowledge rather than from any other source. Those who are skilful from experience only, know indeed that a thing is—they do not know *why* it is; the scientific know the *why* and the *cause* of a thing."

When we erected at our homestead the first steam engine which had appeared in the neighbourhood for the purposes of a farm, some of our friends, by a significant elevation of a finger to the forehead, intimated a silent opinion of some derangement of the functions in that department; we have, however, outlived the flail, and see steam in universal use for all the purposes of the homestead, gradually superseding the sickle and the scythe, and destined, ere long, to supplant the horse in the uplifting all strong and aluminous soils.

Having received, heretofore, numerous letters from friends and strangers, who had recently taken to agriculture, with inquiries as to the course of cropping we recommended, the various tillages we adopted, on manuring, on the quantity, kind, management, and feeding of *stock, and on* various other matters connected with farm

economy, the answers to which were a serious interruption to other avocations, we became sensible of the want of some very elementary instructions for persons so circumstanced. In the year 1856 we mentioned this to the Council of the Royal Agricultural Society, and suggested the expediency of their offering a prize for an essay of this description in the following year. The council entertained the suggestion, with some addition and alteration, and eventually offered a prize of twenty sovereigns "for the best essay on the comparative advantages of entering upon farms in spring and autumn, together with instructions to the young farmer on his entry at either season."

We did not expect that the form of this invitation would accomplish the object we had in view; neither did it in fact. As we continue to receive applications of the nature to which we have before referred, we have taken a hint from Lord St. Leonards' "Handy Book," and have given under the same title, in the following pages, an account of our own proceedings in detail, on the several matters on which we have been applied to from time to time, for the information of the young farmer.

We do not presume to offer any counsel, or to be able to afford any information which would be new to the experienced agriculturist, in the calendarial division of our subject, that will be to him the mere A B C of the science; these observations are intended for the exclusive use of those who are about to enter the portals of agriculture. For that purpose, we know how necessary is that minute detail of operations which would be tiresome to the adept.

To enable the reader to judge to what extent our observations may be applicable to his particular case, we may state that our farm comprises 260 acres, of which

64 are pasture and 196 are arable. The nature of the latter is very variable. Ten acres consist of a deep black loam with a slight mixture of sand, resting upon a strong clay. About 90 acres are what would be usually styled light land, the subsoil stonebrash, resting on the Oolite. The remainder is a retentive, aluminous soil, lying chiefly on clay, which requires careful management in wet seasons, but is useful, productive land when the weather admits of its reduction to a fine tilth.

We shall carry our young friends with us through the monthly operations, in the first place, and reserve our observations on manuring and the feeding of stock for separate consideration. To these latter divisions, and the tables appended, we venture to invite the attention of the more advanced agriculturists. We start with the month of March, as the more common period of entry on farms, though we should much prefer a Michaelmas taking, with the privilege of entering immediately after harvest, to sow wheat and prepare for the next root crops.

In order to a convenient arrangement of our calendarial observations, we have assumed a four-field division of a farm, as by far the most common, but we must not be understood as recommending any adherence to that particular course. On the contrary, we very much doubt whether it can be profitably and economically adhered to for any length of time, as respects the green crops, whether of artificial grasses or roots. These cannot be so often repeated on the same ground successfully. The failure of the clovers under such an arrangement is universally acknowledged, and there exists a general impression that swedes and turnips have degenerated of late years from too frequent repetition.

MARCH.

Seeds.— This is the proper time to consider the seeds of various kinds which will be required during the sowing season,—the clovers, &c., to be sown on the barley, oats, and wheat, seeds of mangold, carrots, swedes and turnips, lucerne, and sainfoin where that is required.

Where broad clover is admissible, that is to say, where none has been sown on the land during the seven preceding years, sixteen pounds per acre at the least, with two pecks of Italian rye grass, should be sown. The perennial clover (cow grass) can be more relied on for a hay crop, but the after-feed will not carry the same stock as the broad clover where that succeeds. On those fields on which broad clover was sown on the previous barley, oat, or wheat crop, that should on no account be repeated. If a grass seed crop cannot be conveniently dispensed with, a mixture of the alsike, and white clover, and trefoil may be introduced as a change, but it is a very partial change. The safer course is to take in the following spring a crop of vetches, rape, or other green foods, or peas or beans if the green crop can be dispensed with.

The selection of seeds is one of the most important provisions for a farm, both in respect of quality and purity. After the most careful dressing and cleaning by the seed merchant, there will still remain seeds of many weeds. Such dressing and cleaning, when carefully performed, are troublesome and expensive operations which must be paid for. Though we must pay

more money for such seed, it will be found by far the cheapest.

OPERATIONS.

We will consider these separately in reference to each quarter of the farm.

The Wheat Quarter.—The first opportunity should be seized for rolling this crop, for which purpose Crosskill's clod-crusher is by much the most efficient implement, if the land be sufficiently dry, which may generally be reckoned on in the course of this month. This may be accomplished, when the land is not dry enough for the Crosskill, by the Cambridge, or other iron roller, presuming at this time of day that all such rollers have well-adapted scrapers acting over their entire surfaces. If there be any wire-worm at work, Crosskill's roller should follow the other roller when the surface admits of it.

If early-sown wheat has been followed by a mild winter, and the plant exhibits over-luxuriance for the season, it may be advantageously fed down with sheep at any time up to the end of the first week in April. This should be done quickly and effectively, by turning in a large stock sufficient to eat it down close in the course of a week or ten days. The treading the land firm is an advantage to this crop. We have found wheat so treated ripe at harvest within three or four days of wheat beside it which had not been fed.

The Spring Corn Quarter: Barley.—If the land in course for this crop has been treated as will be described during the winter, and is quite clean, it will now generally be in fine tilth to receive the seed, and the earlier it is sown the better will be the quality. Since we have adopted early sowing of barley, we have found the

weight of the grain considerably increased, and that we thereby command a price considerably over the average market price. We generally grow it to fifty-six pounds per bushel, and in the present year we reached fifty-eight and a half pounds per bushel, which is a very extraordinary weight, and the quality was remarkably fine. That was sown the beginning of March. The success of this crop depends much on fine tilth—that tilth which weathering alone produces, and which cannot be so effectually obtained by implements. When swedes have been fed off late, and the land turns up in a raw state, and this is followed by a long continuance of dry harsh weather, the sowing must be deferred, and the Norwegian harrow or Crosskill's crusher may be advantageously used to break down the surface. A moderate quantity of rain, which would have little effect upon the merely turned unbroken furrow, will enable you to sow successfully, if the clods have been previously broken down.

If the land be infested with docks, or annual weeds, to a considerable extent, the better plan is to leave it for a time until the seeds of annuals have vegetated. Then any docks should be picked off, and the weeds will be destroyed by the harrows in dry weather. The sowing in such a state of things must be deferred till April. We recommend deferring sowing the grass seeds, after harrowing in the barley, until the plant is three or four inches above ground; the clover seeds will then be sown to the greatest advantage, and merely rolled down. This rolling down of the tracks left by the harrows will sufficiently cover the small seeds. When these are *harrowed* in with the barley, they get much too deeply covered, and a large proportion will not vegetate at all. Messrs. Lawson of Edinburgh, who have taken infinite pains for many years in the cultivation of the various

grasses, clovers, &c., some years ago instituted very laborious but useful experiments in order to determine the depths at which grass seeds should be sown to insure their most successful vegetation. From recollection, not having the figures now before us, the result of the experiments was that the largest proportion of the seeds vegetated when covered from 0 to a quarter of an inch, about half when covered an inch, and none when covered from two to three inches. This is one of the many instances in which we may safely consult the economy of Nature—she sheds her seeds on the surface.

Oats should be sown early in this month. When the soil in this quarter is much intermixed with clay, and is of an aluminous and less tractable tilth, oats should be preferred to barley. The after-treatment will be the same. When it is not intended to sow clover or grass seeds with these crops, they should be drilled not less than nine inches apart in the rows, and be horse-hoed. After which they should be gone over by women or boys, to cut out all thistles, and extract any docks which may exist in the rows. The end of April or beginning of May will be the best season for the latter operation.

Beans and Peas.—The autumn-sown beans will now be ready for the first horse-hoeing when the land is dry enough; but before this is attempted any docks should be carefully forked out. If the spring beans were not sown in February, no time should be lost in committing the seeds of these and of peas to the ground. We recommend setting beans with the dibble, as insuring a much more regular crop than the drill. The ordinary practice is to sow the beans in rows at regular intervals of eighteen or twenty inches. If they grow as strong as may be anticipated in land in good condition, by the time they are in full blossom the tops will meet, and

exclude the sun and the free access of the air, which materially affects the setting the fruit. To obviate that disadvantage, our practice has been to set two rows a foot apart, and leave at least a two-feet interval between those and the next two rows, and so on through the field. This leaves a larger surface of blossom exposed to sun and air, of which we have found the advantage, particularly in the fruiting the lower parts of the stems.

When the beans are three or four inches above ground, and the ground is moderately dry on the surface, the beans should be harrowed across the rows with the light harrows; and afterwards, if dry enough, rolled. This apparently reckless process was introduced to our notice as a Norfolk practice. We were disinclined to adopt it until we had an opportunity of consulting that *primus inter pares* of agriculturists, Mr. Hudson, who assured us we need not fear the process, which was considered in Norfolk as tending to shorten the straw and render the stem more fruitful. On adopting this treatment for the first time, we harrowed only one portion of the field; we harrowed and rolled another portion; and we left a third portion neither harrowed nor rolled. The latter produced a very inferior crop to either of the other portions, on which the yield was very good. The inferiority of the third portion was palpable to the eye during the whole period of growth. There was no apparent difference observable in the other portions during growth, but those which were rolled as well as harrowed were considered the most fruitful by the cutters at harvest.

Where couch (which is differently named in various districts)—we mean the "triticum repens"—and docks abound, they must be forked out of the peas and beans,

and removed before the horse or hand-hoeing is attempted.

Lucerne should be sown towards the end of this month, which you will find a very useful and productive food for horses when the heaviest work has been got through, and you begin to diminish the allowance of corn, and the carrots have been consumed. About an acre and a half will supply a constant succession of green food for eight horses during the summer months; say from the middle of May till October. For this crop the land should have been deeply ploughed early in autumn, well manured, and thoroughly cleaned. To insure this, it would be advisable to take a root crop from it the previous season. About fifteen cart loads of good manure should be laid on, and ploughed in not later than February, if the weather permit, which will afford time for any annuals to vegetate before the lucerne is sown. This should be drilled in rows twelve inches apart, and horse-hoed as soon as the plant is three or four inches above ground, and any weeds should be cut out of the rows. This will, in most seasons, give you four cuttings — always three. The scythe should be followed by the hoe in every instance. We cut our first lucerne patch for nine successive years without any obvious diminution of yield. During the tenth year, the hoeing, from some cause, was neglected; the natural grasses sprung up, and under the impression that the lucerne plant was worn out, we prepared a new patch. Aware of the great depth to which these roots descend, and that buds are produced on the stems beneath the surface, we tried the experiment of breast ploughing the old plant, to clear away the surface grasses, for the chance of getting a cutting or two in aid of the new plantation, and we were somewhat surprised at getting,

from the old stools, nearly as good a cutting as we had obtained in preceding years. Quantity of seed per acre, if good, sixteen pounds.

Where potatoes are grown, if the land were not sufficiently dry in February, the first opportunity should be taken in this month to ridge up the land, presumed to have been manured and subsoiled in the autumn, with the double mould-board plough. When dry enough, a light wooden roller may be taken over the ridges to even the surface, and insure the sets being planted at equal depths, which should not be less than five or six inches. It has been observed that disease is most prevalent in the tubers nearest the surface of the ground.

Mangold, Carrots, or Cabbage. — The land intended for these crops, if quite clean, and of a friable nature, may continue at rest during this month, if prepared, as directed, in the autumn; but if there has been much wet in the winter, and the land be of an aluminous nature, however finely the frosts may have pulverised the surface, the under soil will be found raw and sticky. In that case, it is expedient to plough the ground with the two horses at length, walking in the furrow, as early in the month as possible to weather the under surface; and if it be intended to sow on the flat, to the depth of eight or nine inches.

When the manure has not been ploughed in in the autumn, and the objectionable course is adopted of laying it immediately under the ridge on which the seed is to be sown, the ridges should be thrown up as early as possible in this month, and the dung laid in the intervals, thoroughly spread, and the ridges reversed. This process should immediately follow the placing the dung to preserve the moisture.

We have for many years advocated an increased

growth of mangold for various reasons. It yields, as compared with swedes, under similar treatment, at least one-fourth more weight of food; it is comparatively free from the attacks of insects and atmospheric changes, which so often mar the swede crop; it is in the greatest perfection for feeding purposes at a season at which the swede crop, if not used up, begins to degenerate, and is of little value if left in the ground, and it will maintain its nutritive qualities throughout the summer. Its value for ewes and lambs in a late spring is incalculable.

We state this with all due deference to the high authority of Dr. Voelcker, who states, in his pamphlet on the "Chemistry of Food," "that mangolds ought not to be given to sheep." This broad statement is founded on experiments with fatting sheep which, it seems, required four weeks before they became reconciled to the taste of mangolds. This is the case, to a greater or less extent, with all animals on sudden changes of food. Such changes should be effected very gradually, by admixture of the food proposed to be substituted with that to which they have been accustomed. Towards the close of the swede crop, we introduce mangolds cut up with them, and our tegs, or hogs as they are called in some districts, are finished off with them in March or April. As soon as the ewes begin yeaning in February, they and their lambs are fed on mangolds mixed with hay chaff until the grass is ready in May. We have adopted this practice many years, and have found the animals do well.

Our fatting bullocks have no other roots than mangold after December. Analyses are very useful guides in the economical selection of the food of animals; but such are the peculiarities of the animal organism, and that even in those of the same species, that a food which

analysis shows to be compounded of elements highly nutritious, will not feed animals to maturity so fast as another description of food presenting, on analysis, much less promise.

A very interesting experiment of the late Lord Spenser, on the comparative feeding qualities of mangold and swedes, which is recorded in the "Journal of the Royal Agricultural Society," will be found in the Appendix, as well as one of Mr. Hillyard's, in the same volume of the Journal, which led to a different result to that of Lord Spenser's.

Furthermore, we believe that four years is too short an interval for the recurrence of the swede crop, we therefore recommend taking equal quantities of land under swedes and mangold — reversing them in the next rotation, by which each may be secured an eight years' interval.

An objection has been raised to this course, that it would be prejudicial to the succeeding crops in the rotation, inasmuch as mangold is always carried off the land and the swedes are usually fed off on it. That objection may be thus obviated, and we adopt this mode of meeting it:—Commence your fields, laid out for mangolds and swedes, by first taking as many turns of your drill, according to the width of it, seeded with mangold, as will admit of ample space to pull, place, and cart away the produce,— say, for instance, eight ridges,— then leave the same number of ridges to be sown afterwards with swedes; and thus proceed sowing your mangold with the same intervals left for swedes throughout the field. About a month later, you may drill those intervals with swedes. The mangold may be conveniently harvested without any interference with the swedes, and the latter fed off in the folds, the land

will thus receive equal manuring throughout. The after-treatment of both crops will be the same.

During the month of March, as soon as the drying winds set in, the fires should be lighted in the rubbish magazine, hereafter described under the head of manuring, and be attended to night and morning until the whole is reduced to ashes.

If you manufacture your own superphosphate, which, in many localities is the safest course, you should prepare for this the beginning of this month.

Dig out a space near the homestead, six feet by three, and thirty inches deep, line it with brick set in coal-ash mortar, and pointed with Portland cement. This will serve the purpose for future years. Procure just four times as many bushels of half-inch bones — the smaller the better — as you may have acres in course for the root crop. Not to perplex you with further proportions, we will give you the requisite proportion for one acre, which you can multiply according to your acreage of roots.

On four bushels of the bones sprinkle water until the whole are wetted; then place them in the pit. After they have lain for a day or two, add to five gallons of sulphuric acid ten gallons of water, and pour it gently over the crushed bone. Stir this occasionally; and after the mixture has lain two days, it may be removed from the tank, piled in a conical heap, and covered over with ashes. It may remain several weeks in this state, during which a more complete disintegration of the larger pieces of bone takes place. As soon as one tank full has been prepared, another may be started. When the superphosphate is wanted for drilling, it must be thoroughly mixed with dry ashes to pass readily through the drill. The sulphuric acid of commerce used for

this purpose should have a specific gravity of 1·85; at least 1·70. In order to test this, fill an imperial pint with water, having first counterpoised the pint. The water should weigh twenty ounces. Pour off the water, and fill the pint with the acid; that should weigh seventeen ounces, or thereabouts, more than the water.

Should your farm be readily accessible to such manufacturers of superphosphate as Mr. Lawes or Messrs. Proctors of Cathay, near Bristol, or others of reputation, we believe, from their power of manufacture upon a large scale, they can supply you with as good an article and as cheaply as you can make it yourself.

APRIL

Will be a busy month.

Wheat Quarter.—Assuming the processes suggested for March to have been accomplished, and the land to be dry on the surface, the medium-sized harrows should now be taken across the rows of wheat. This will disturb the small weeds in the rows not destroyed by the horse-hoe, and break the surface crust about the plants. The beneficial effect of this process will be apparent in a few hours. The women should then go carefully over the crop, and cut off any thistles which will be making their appearance towards the end of this month, and fork out any young docks which may exist. This is too often neglected; but it must be borne in mind that these plants ripen their seeds as soon as the wheat, and often shed many before that is harvested. It will be found much cheaper to destroy these plants in the spring than to eradicate their produce in future years.

The Spring Corn Quarter.—The first chance of a fine tilth should be seized to get in any barley or oats which were not sown in March.

The Beans and Peas should now be looked over with the fork, to turn out root weeds and couch, preparatory to horse-hoeing between the rows, and hand-hoeing in the rows, which will be required sooner or later in the course of this month.

The Seed Quarter.—The seeds, directed to be procured in March, may now be sown on the barley and oats, and rolled down with a heavy roller. If it so

happened that the surface was left somewhat rough after the spring corn was sown, it will be desirable to wait for rain prior to sowing the seed, and to pass a bush over the field after sowing, and before rolling down.

There is a prevailing opinion that the use of Italian rye grass seed with the clovers is injurious to the succeeding wheat crop. This is not an unreasonable impression, inasmuch as they are of the same family, and would, no doubt, consume the same food.

When, however, it is borne in mind, that the only loss which could arise would be in respect of the rye grass *mowed for hay*, and that even then it will generally have been fed off by the ewes and lambs before the clover started, and again after mowing, the loss cannot be very serious; the rye-grass seed may be confined to those fields which it is intended to feed throughout the season, if the land be not in high condition. When entirely fed off, it is difficult to conceive that the wheat crop could sustain any injury. We consider that when a farm is in high condition from abundant stock, this consideration may be disregarded.

The Root Quarter.—Potatoes, if not planted in March, should be set as early as possible in this month; on ridges two feet apart for such as grow their haulm about two feet in height, and three feet for such as exceed that growth. Just as the shoots appear the light harrows should be drawn over the ridges. The mould boards may now be removed from the plough, described amongst the Implements, and the wings screwed on. The pointed sole being set to penetrate the earth, between the ridges, to the depth of four or five inches, the implement may be drawn up the intervals by two horses walking in the furrows: the

sides of the ridges will thus be cleaned, and pulled down, and left to weather till the plants will require earthing up, in May.

The *Carrot* ground should be harrowed over the beginning of this month, and left for two or three weeks for the annual seeds to vegetate before the carrot seed is sown. The ordinary annual weeds vegetate much more quickly than the carrot. Unless the precaution we have suggested be adopted, the young carrots will be smothered by the weeds, and the cleaning become very troublesome and expensive. From the peculiar nature of the carrot seed, it requires some management before it is committed to the ground: a fortnight previously to sowing, we mix the seed with dry ashes, so as to separate the seeds as much as possible, and then slightly damp the mixture with a fine rose watering-pot, and turn this over daily, for about ten days, till the seed begins to germinate. Before drilling, some dry ashes are turned over with the seed thus prepared, in order that it may run more freely through the drill. With these precautions, a regular plant may be relied on, and one which will get away before the weeds, disturbed by the previous harrowing, can overtake it. By adopting this course we have diminished the cost of cleaning the crop at least two-thirds. We sow the seed in rows, eighteen inches apart. When the carrots are two or three inches above ground, they should be horse-hoed; then cut out with four-inch hoes, leaving a small bunch of plants. This is quickly done by women; you must see they are cut off *below* the crowns, otherwise they will shoot again. They may then be singled, by hand, by boys or girls, when the ground is sufficiently moist for the roots to draw easily, without breaking off the tops.

The ***Mangold*** seed may be treated with advantage

the same as the carrot, which will insure a more regular plant. No crops are generally so patchy and irregular as carrots and mangold, for want of a due separation of the seeds. By the means we have recommended, from long practice, we obtain very regular and uniform plants. We prefer sowing the mangold the last week in April, rather than earlier, as it is tender and liable to be destroyed by frosts, which often occur during the first fortnight of May.

We recommend sowing, broadcast, over the mangold-ground, before it is harrowed down, about 3 cwt. of salt per acre;—the refuse salt from the works at 13*s.* per ton put on the rail. We sow this seed with the two-row ridge drill, with concave rollers, described under the head of Implements, which deposits under the seed forty bushels per acre of the ash mixture, described hereafter under the head of Manuring. We have the mangolds bunched out, as described for the carrots, but with a 12-inch hoe, and singled in the same manner, by hand, to about 15 or 18 inches from plant to plant. The ridges will be 26 or 28 inches apart, as the drill may have been constructed. As soon as the plants have thoroughly recovered the singling, they should be horse-hoed, and then hand-hoed between, stirring all the earth and drawing it rather away from than up to the plants. However clean the land may be, the plants will be greatly benefitted by a repetition of these hoeings in dry weather.

The smooth iron roller should follow the ridge drill when that is used, and if the three-row drill be used for manure and seed, which is described under the head of Implements, the light wooden roller should precede that drill, which should be followed by the iron roller. The mangold seed requires a firm bed.

Cabbages. — For this crop the seed of the true large drumhead cabbage should be *thinly* sown on a patch of ground, nicely prepared for a seed bed, about the middle of August. The beginning of November the seedlings should be transplanted into beds, about four feet wide, leaving an alley between for weeding them subsequently. On these beds the plants may be set in rows nine inches apart, and two or three inches from plant to plant, in the rows. This checks their growth above ground, and the plants make good fibrous roots, which give them an early start when planted out in the spring.

The most forward plants may be set out for the first plantation of one-third of the ground allotted for this crop towards the end of the month. It is presumed the land will have been prepared by ploughing and subsoiling, in the autumn, and be clean, the cultivator having been taken over the land, and any couch or root weeds picked off; the ground must be laid up in ridges, three feet from centre to centre, and the plants set three feet apart in the rows. If the land be foul it should have been cross-ploughed deeply at an earlier period, with three horses, to avoid any treading on the turned ground, and picked clean. As it may be desirable to stir this crop deeply with the horse-hoe-grubber, after described, across the ridges, as well as up the furrows, the plants should be accurately placed. This is accomplished by the use of a line, attached to a stick, just three feet long, at each end, and laid across the ridges. As each row of plants has been set the workers at each end of the line move it forward just the length of the stick to which it is attached. The plants should be loosened in their beds by a small hand-fork, to prevent damage to the young roots by pulling from the *firm ground,* stowed in baskets by boys and girls, and

carried to the ground, and laid by them separately down the ridges, just before the planters. The planting may be done by women, each of whom should be furnished with a semicircular trowel, to open the ridge freely on setting the plants. This is material when the land is moist, as it should be for the purpose, as the roots then strike out freely; the common setting-pin forms a puddled hole, which obstructs the striking of the young roots. The outside setters may be two men to manage the line.*

You will seize the first opportunity of mild weather, after the middle of this month, to wash the fatting sheep intended for sale, in order to their being shorn for market. When that has been completed, the ewes, tegs, or hogs, will undergo the same process. By the end of this month, lambs dropped in January and February may be weaned. When the ewes are separated, they should be taken away at once to the wash pool, and then shearing may be proceeded with. As soon as the lambs become reconciled to the loss of their mothers, they should be dipped in the usual compound for the destruction of all insects. When taken out, the fluid should be pressed out of the fleece by the attendants, so as to prevent any subsequent dripping from the body. The safest course, in all cases, after dipping lambs or ewes, is to turn them into a yard for a few hours before they are turned back on the pastures; as serious mischief has resulted from their eating grass which has been poisoned by sheep having been turned on it before the fleece was ufficiently dry on the surface.

* We have just set out, in this way, 10,410 cabbage plants (June), on upwards of two acres of ground, between the hours of eight and twelve in the morning, by four men, six women, and two boys to place the plants on the ridges before the setters.

MAY.

THE *Wheat* and *Spring Corn* quarters will demand no further attention till harvest, unless infested with docks and thistles. In that case it would be desirable to look over land subject to these pests at the end of this month, to remove such as may have vegetated since the previous examination. Should your wheat plant look weak and unpromising, it would be greatly assisted by sowing, broadcast over it, twenty or thirty bushels of soot per acre, immediately before or after rain. From two to three bushels of salt per acre may be advantageously sown in like manner over barley and oats.

The Root Quarter.—The *swedes* demand our first attention. If the land has been prepared and manured in autumn, as directed, it should now be deeply stirred with the cultivator, if dry, and ridged up; the light wooden roller then passed over, to level the surface ready to receive the seed at any convenient time, from the middle to the end of this month. If it be intended to lay the manure under the ridges, that should have been hawled and spread in the furrows, and the ridges reversed as soon as the land was sufficiently dry in March or April.

We think mischief has resulted from agricultural associations having offered prizes for a given number of swedes, mangolds, &c., which have been usually adjudged to the largest roots. A few roots can easily be raised of monstrous dimensions, by extra manuring, and manipulation. These are then transferred into the shops

of the seedsmen, as specimens of the fecundity of their seed. Now all this is just so much worse than delusion, that it encourages the notion, that great size is the perfection to be aimed at. We have observed, in consequence, a disposition to increase the width between the rows of the root crops, and the distance from each other in the rows when set out. The weight per acre is a far better criterion, and the specific gravity of the roots is the best of all. It is on this that the real feeding quality of roots depends; and we should be disposed to give a much higher price per acre for the larger number of medium sized roots than for the smaller number of large roots, even were the weight identical, as being of superior feeding quality.

Assuming the ash mixture to have been prepared as hereafter described under the head of Manuring, and the superphosphate of lime to have been procured, and the field about to be sown to be ten acres, the ash heap is broken down in thin slices by the spade, to effect a further mixing, and thrown through an iron screen, until 400 bushels are screened. With this we mix thoroughly 30 cwt. of superphosphate. This mixture is sown with the ridge manure and seed drill, which is followed by the light wooden roller, which may be made just wide enough to pass through an ordinary gateway that would cover four ridges at once.

As soon as the plants are two inches high, they should be horse-hoed preparatory to the setting out. We consider the plants should be set out sixteen inches apart, but some cultivators recommend eighteen inches in preference.

We recommend the employment of women in preference to men for this work. They can do it quite as well, and as quickly, and earn considerably more than

ordinary day wages, at a shilling per acre less than men require. There is a more useful plan still, where it may be feasible, which we observed some years ago on going over the admirably managed farm of Mr. Thomas of Lidlington, on the Duke of Bedford's estate. He had a set of boys and girls on either side of a careful man, hoeing his swedes and turnips. We never observed better hoeing than that done by these children. We understood him to say that a sum was given equivalent to the value per acre of the work well performed. This, instead of being equally distributed, was divided according to the tickets given by the overlooker, and produced on the pay night. This created a degree of emulation which made very effective hoers at an early age.

After a second horse-hoeing, the women go over the crop a second time, which will complete the work up to the final stirring up of the intervals between the rows.

Women will earn good wages at three shillings an acre for the first singling, and two shillings and sixpence for the second hoeing. The same hands should undertake the two operations, and to secure this we recommend paying the two shillings and sixpence for the first and three shillings for the last hoeing.

The *Mangolds* sown in April will be ready to bunch out towards the middle or latter end of this month, as described under this head in April.

The *Carrots* will require the same process toward the end of the month.

Cabbages.— Another third of the land devoted to this crop may now be planted out when rain appears imminent. The former planting will require horse-hoeing with the single hoe, set to cut deeper than Garrett's hoe. This may be taken up the spaces between the rows, and across them, if this does not interfere with a contiguous

crop, otherwise the hand hoe must be used across the ridges. This should be done by men, as the ground should be thoroughly moved around the plants.

The potatoes will require to be earthed up sooner or later in this month. If the preparation directed for April has been made there will now be abundance of fine earth between the ridges. The mould boards will now be replaced, and the plough set so as to go to the bottom of the loosened earth, and the plants may thus be thoroughly and expeditiously earthed up.

Towards the end of this month the fences should be looked over, and the larger weeds cut away, which will now be smothering the lower growth of the hedges.

JUNE AND JULY.

After the middle of June all hands will generally be required in the hayfield. Every exertion should therefore be previously made to get the root crops set out and hoed, so that they may require only incidental attention during the haymaking. Excepting when hay is being hauled to the rick, the carter and one or two of the ploughmen should always have the horse-hoes at work during these months; and that though there may not be a visible weed. The frequent stirring of the soil is not only most beneficial to the root crop, but to the soil itself, by exposing fresh surfaces to the various atmospheric influences. We may here notice a vulgar error prevalent amongst ill-informed farmers, that stirring the soil in dry hot weather "lets the drith in." On the contrary, the advantage is two-fold. The moisture is thereby retained in the subsoil, and evaporation proceeds more slowly from a finely pulverised surface, while such a surface absorbs moisture from the atmosphere, particularly during the night, much more freely than an indurated surface. We had an opportunity of verifying this during a hot dry summer some years ago, by comparison of two fields of swedes of equal quality in the early stages of growth. Ours were repeatedly horse-hoed, though perfectly clean, and our neighbour's were undisturbed by that process. The former stood up, and never changed colour, while the latter drooped under the influence of the sun daily, and all the under leaves turned yellow.

Towards the end of June, the last third of the land set apart for cabbages should be planted immediately on the fall of rain.

In the course of July, the land under vetches will be gradually cleared by the sheep. The plough should follow the fold closely, turning a shallow furrow. If the soil be moist and mellow, the turnip seed may be sown close after the plough. If the land be dry and hard, the more common case at this season, it may still be ploughed, and then rolled, and left for the first rain. The furrow having been broken down to some extent with the roller, a less quantity of rain will admit of sowing than would have been otherwise requisite.

Where a breeding flock is kept, and there is a large stock of lambs, the dwarf Essex rape may be sown with great advantage on the land on which the vetches have been fed off. The ground should be lightly ploughed, and if moist, and in good working order, the seed may be drilled at once, four pounds to the acre, in rows not less than eighteen inches apart. If the ground be dry, it would be desirable to wait for rain. If you get rain soon after sowing, you may reckon on turning in your lambs in eight or nine weeks. At first this will require some care; they should be folded for a few hours at a time, and then turned back for a time on your seeds or pasture; for if allowed to feed on the rape without stint, they will occasionally get blown.

You will often, at this season, have the opportunity of a catch crop of white mustard. For instance, if your clover or other seed crop have partially failed, so as to produce but spare feed, it may be ploughed up when fed off, and sown with white mustard at the rate of twenty-four pounds per acre. This furnishes very good food for sheep and lambs in a few weeks, and may be

fed off in time for the land to be sown with wheat. Or, if you have plenty of other keep, the crop may be ploughed in as a manuring, but we think this more effective when it has passed through the animal laboratory.

Potatoes in the course of June will usually require a little hand-hoeing, and any loose earth should simultaneously be drawn with hoe close up to the stems of the plants.

The yellow Aberdeen, and turnips of that class which stand the winter, may be successfully sown any time in July after vetches.

As soon as the hay is harvested, we cut over our hedges in the interval between that and the corn harvest, and at the same time decapitate any weeds about them before they ripen their seeds. A well kept hedge should be finished off at the top like the roof of a house. If the top be allowed to grow stag-headed and overlie the bottom, the drip will damage the lower part.

AUGUST.

For any sowing of turnips after vetches later than July, we recommend the red Nottingham, as attaining a large size in a short time, and as being hardier than most of the quick-growing sorts. We have had the ground well covered by this turnip even after harvesting wheat in an average season. The crop was sound and good at spring for ewes and lambs.

Just before the swedes and mangolds cover the ground, when a horse can tread up the furrows without damaging the plants, we strongly advise you to finish the operations by an effectual stirring up the interval between the ridges, some four or more inches in depth. For this purpose we recommend the common triangular iron Scotch expanding horse-hoe, described under the head of Implements, used for the first horse-hoeing, to be so constructed, that the hoes being fixed into the frame by a wedge, are easily removed; and in lieu of them tines are introduced, slightly curved forward, with hardened points like a common cultivator or grubber. If the ground is very firm, we put on two horses at length, and stir the ground four or five inches deep between the rows. If you have thus treated a portion of a field, and have been obliged to leave the work for three or four days, you can see from the increased luxuriance of the plants where you left off, without going into the field. Furthermore, this process leaves the ground in the most favourable state for the absorp-

tion of moisture and other atmospheric influences, and in a state in which it retains moisture.

We shall now be in the middle of harvest, and will therefore consider the various modes of severing the corn.

Wheat, until of late years, was generally reaped. The go-ahead farmers of the present day, impatient at this slow operation, adopted the plan of mowing to the corn, and then tying up. This also saved the subsequent mowing of the stubbles. Considering this simply as a mere field operation, an acre of wheat can be mowed and stacked in one-third less time than it can be reaped by the same number of hands. Supposing we set on four mowers, the party would require, in addition, eight women; one to follow each mower to remove his swathe, and another to tie—one man to stack the sheaves, and another to rake, and tie up rakings after the stacker; in all six men and eight women. We find these hands would get over six acres a day, taking one crop with another; and that the same hands would reap and tie up four acres per diem. The cost per acre of the mowing we find to be eight shillings, and the cost of the reaping twelve shillings, including the mowing and raking the stubble afterwards, without beer.

On these data we adopted the mowing system, much to the disgust of sportsmen; but we soon found there were other elements affecting the computation, both as respects economy of time and money. When wheat has been mowed, we have one-fourth more in quantity to stack; consequently, a much larger surface to thatch. Reaped wheat is more easily and regularly disposed in the stack, more easily trimmed, and with much less waste of corn in that operation. It is

threshed with at least one-fourth less power than mown wheat, and with less waste of grain. In those cases in which the improved practice of cutting up the straw for litter is adopted, there is a saving of power to the extent of the stubble; and where that is not adopted for want of power, the stubble makes the best manure, as being the most ready absorbent of the urine of the animals. Taking all these matters into consideration, we are advocates for reaping in preference to mowing, with the exception of the small portion of the wheat quarter on which it may be intended to take vetches for spring feed before the turnip crop. This will require to be cleared as soon as possible, and ploughed.

We have not yet seen any reaping machine by means of which, all things considered, we are convinced that the crop can be harvested more economically and satisfactorily than by ordinary mowing or reaping, assuming hands to be readily obtainable when required at the usual rate of wages, otherwise no doubt the best machines of the present day are useful and economical auxiliaries.

Barley and Oats, of ordinary growth of straw, we mow to the corn, and tie and stack the same as mown wheat. If very short, after an unusually dry season, it must be mowed out in the ordinary way. The mowing to, and tying up the barley and oats, as compared with the cost of mowing it out in the usual mode, is so much more expensive, looking only to the mere severance of the crop, that we can hardly anticipate the general adoption of the practice. That, however, is a limited view of the question. When the crop is once set up, there is an end of the expense, be the weather what it may. It is carried and stacked in half the time by the same hands, and is delivered to the threshing machine

with much less waste. In either a dripping season, or in the event of occasional storms, more or less frequent turnings are avoided, and the consequent staining, and, in the former case, sprouting of the greater portion of the grain. If carefully mowed, gathered, and tied, we have had it, in an unfavourable season, standing set up for some weeks without injury, with the exception of a few heads tied in beneath, or under the band. In fine settled weather, when no rain occurs between the mowing and the stacking, the ordinary plan of mowing out and harvesting is rather the cheapest; but taking one season with another, we believe the other system to be the most economical.

Peas should never be mowed, but gathered together, just above the roots, by a stick with a curved end, and cut with a sickle, and left in small heaps; and this before the pods are over ripe. After autumn-sown winter peas, and indeed after peas of an early sort sown early in the spring, a good crop of the red Nottingham turnip, or other quick-growing hardy sort, may be obtained in favourable seasons, if the land be clean and in good condition. When the peas have been sown in the spring, it will be expedient to cart them off, as soon as cut, on to a pasture to dry, to admit of sowing the turnips as early as possible; as on a few days at this season may depend the success or otherwise of the turnip crop. If the land be very clean, and in a mild open state, nothing more will be required than taking the scarifier over it to secure a good seedbed. If there be much annual weed, it would be proper to take the harrows over after the scarifier, and gather and burn the vegetable matter before the drill. In some states of the land a light ploughing may be necessary.

Beans are severed in the same mode in all districts,

and the only observation we have to make is, that they are generally allowed to stand too long before they are cut, which leads to great waste of the grain. Nothing is more common than to see the ground strewed with beans, on the mere cutting them, sufficient to seed the ground, to say nothing of the further waste before they arrive on the stack. It is true, the scattered beans may be picked up by pigs, but they may be fed, at that season, more economically.

SEPTEMBER.

By the first of this month we assume all the corn and grain to have been stacked and thatched, and the ricks trimmed and dressed immediately under the eaves of the thatch, so as to insure the destruction of all mice which may have been brought in in the sheaves. We also assume that all the ploughs, drags, harrows, rollers, drills, &c., have been carefully looked over before they were laid aside, and repaired where necessary, in order that they should be in a thoroughly efficient state for the busy and important season of autumnal cultivation, on which the succeeding crops so materially depend.

A portion of the seeds will no doubt have been ploughed up in August for wheat; this should at once be completed, as it is desirable to have the furrow turned for a couple of months prior to sowing the wheat. In order to keep the surface-grass well under, see that your skims on the ploughs are in good cutting order; and so fixed, with reference to the setting of the share, that they shall effectually pare the grassy surface and bury it. If the land has not been fed close, the chain and weight adapted to Howard's ploughs will materially assist in drawing long grass under the furrows. As soon as the surface is sufficiently dry, we close the furrows by the roller, as a further impediment to the growth of the grasses, which otherwise become troublesome during the interval between ploughing and sowing.

In the early part of this month, we select the weakest field in course for the root crop, for a crop of vetches to

be fed off, and followed by turnips, generally nine or ten acres. On this we spread and plough in eight or ten cart loads per acre of good manure, and sow one-third, the first week in this month; another third about the second week in October; and the remaining third in February or March, to come in in succession. With respect to the seeding, we recommend for the autumnal sowings, a mixture of two bushels of vetches with one bushel of winter-oats. The latter help to keep up the vetches, as they grow, and form a tender and succulent food.

The remaining wheat stubbles should now be looked over, to fork out any patches of couch, &c. Under the treatment we have recommended, the stubbles will be clean; but in case any should have been entered on in a foul state, or should have become so from neglect, they should be pared with Bentall's or Hart's broadshare with four horses, from two to three inches deep; and, when sufficiently dry, thoroughly moved with the drags, to be followed by the harrows; then rolled and harrowed again. The weeds and roots of the wheat thus disengaged from the soil are gathered by iron rakes into rows, say eight or ten feet apart. These rows, when sufficiently dry to burn, are set up in cocks, about the same distance apart. While this is proceeding, other hands draw round the cocks, with the rakes, the coarser parts of the soil. One man proceeds to light as many of the cocks as the hands with the rakes can well attend to for the remainder of the day; and as soon as the fire is established they shovel on the coarser earth over all the cocks which are burning. They then return, and with the backs of the rakes draw all the rest of the soil within reach of the cock to form a circle round it. As soon as the lumps first put on are kindled, the finer earth is scattered over the heap, gradually, so as entirely

to smother any flame. These are gone over again the last thing before the men leave at night, and the remaining soil is then thrown over the heaps. This is a nice operation, requiring care and judgment. If properly done, when the work is left, smoke should only be discoverable issuing from the heaps upon close inspection. All the loose soil, the result of the previous implemental operations, should have been disposed of, and on the following day, sooner or later, these heaps of weeds and seeds and surface soil will have been converted into valuable ashes—in a word, this is *stifle-burning*. We have thus minutely described the process, for very few labourers understand it; and it requires vigilant superintendance of the master. The point to be attended to in this process is to accomplish the slowest possible combustion. These ashes will then be scattered immediately in front of the ploughs.

OCTOBER.

After the sowing the second crop of vetches, you will probably commence sowing wheat on such land as may be fit. Not many years ago we frequently heard of samples of wheat offered for sale, characterised as being only fit for seed. On expressing some surprise at the observation, we have heard it stoutly maintained by farmers of that ilk, that poor thin wheat would produce a better crop than the finest berry. We never believed that the embryo embedded in a scanty pabulum, on which it has to rely for its first growth, would produce so strong and healthy a plant as one provided with ample food. It has therefore been our practice to select heavy seed for all crops, and we recommend you to do the like. We also advise a frequent introduction of new seed from other soils, and not to use that grown on your own more than two seasons in succession.

The day before you sow your wheat dissolve one and a half pounds of sulphate of copper in two gallons of water, to be sprinkled over every eight bushels of seed. The root crop of the present year and the preparation for that of the succeeding year should now engage your attention. The dry weather which commonly prevails in this month favours the hauling out the manure upon the wheat stubbles, which may be continued so long as the weather continues dry. This, shot in the usual heaps, will remain uninjured a considerable time. Dr. Voelcker contends this would be the case even were it spread over the surface. We think, however, the

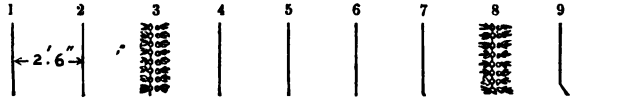
safer course is for the spreading to be carried forward immediately before the plough. Two men may be sent on to throw the dung before the women come to work in the morning; the men may be followed by four women with forks to beat and distribute it evenly over the surface. We then set the ploughs to a seven or nine-inch furrow, according to the nature and depth of the soil, selecting the strongest pairs of horses, and follow each team by Reid's subsoil plough, with a pair of lighter horses. The latter is set to stir the subsoil from four to six inches below the furrow first turned. In order to secure the thorough aeration and weathering of all the soil thus turned and stirred, it is material to avoid all subsequent treading on it. This is accomplished by having that which is technically called *the bridle* of the plough, the iron to which the horses are attached, made so as to extend about a foot on the land side. By this means both horses walk on the land to be ploughed, and turn the furrow over on the subsoiled base. A considerable surface is thus not only exposed to atmospheric influences during several months, but the manure becomes entirely decomposed and distributed throughout the soil. This process is not recommended for very light, sandy, or shallow soils. On the other hand it is most beneficial in aluminous and clayey soils, which commonly contain phosphates in an insoluble state until they are stirred and exposed to the atmosphere, and are thus rendered available.

When it is considered how far the small fibrous roots of turnips and mangolds really spread in all directions in search of their appropriate food, we believe this to be an improvement on the practice which has of late years more generally prevailed of reserving the manure to be laid in the furrows after the land has been ridged up in

the spring, and then to split the ridges over it. The latter practice probably originated in the apparent tendency of these plants to the formation of a tap root, which descends immediately into the manure. We are inclined to consider the tap root rather in the character of a mechanical support to the plant, and that it is the fine, almost invisible, fibrous roots, ramifying in all directions, which mainly contribute to the nutrition of the bulb, and which, by the process we recommend, they find distributed as generally.

If the mangold has been sown towards the end of April, as we have recommended, it will be quite ripe and fit for harvesting at any time during this month. This crop is often exposed to danger by being left out too late in the season. It should always be carried, and partially covered by the end of this month. A degree of frost very frequently occurs during the nights of the first ten days of November that would seriously injure mangolds which had not been pulled, and which would destroy any that had been pulled and left exposed on the ground, except for immediate consumption. This is a very tender plant, and should never be exposed to frost.

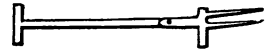
Having paid a good deal of attention to the harvesting this crop, and tried various ways, we will describe that which we have ultimately adopted as the most rapid and economical. We will assume the mangold to have been drilled on ridges thrown up two feet six inches apart. The following diagram represents ten rows of mangold, and the disposition of the roots when pulled.



The roots are all pulled and placed by women. Two begin with pulling the third row from the field fence, one on each side—the one laying her tops to her left and the other to her right—say on No. 3. One of the women then pulls Nos. 1 and 2 and lays her roots in the same direction, in the intervals between those which she has pulled on No. 3. The other woman proceeds at the same time, pulling and laying the roots from Nos. 4 and 5 against those on her side of No. 3. Two other women are proceeding in the same way with No. 8; the one pulling and placing Nos. 6 and 7 and the other Nos. 9 and 10. As soon as a sufficient surface has been thus cleared for the carting to commence, the women, or boys and girls, furnished with blades made out of old scythes and sickles, stuck into handles, cut the leaves off the roots thus arranged nearly as fast as they walk. About nine feet clear will thus be left for the carts without injuring roots or leaves. When the roots have been carried, the leaves are left in a convenient state to turn in stock to pick them over if keep is short, or they may be ploughed in, which is the better practice. If the roots are very large, it will be desirable to place four rows in one line, instead of five, as directed above. We found, on employing men by piece-work, the ordinary terms were six shillings per acre for pulling and topping, and two shillings for loading and carting, with which men were never satisfied, and the work was done with no system, and in a very rough and unsatisfactory manner.

When the land has been kept clean, and well-stirred during the growth of the roots, women can perform nearly all this work as well as men; and we find by the *plan we recommend* that our trained women earn extra *wages at this work*, and the ground is more quickly

cleared at a total cost for pulling, topping, and loading of six shillings per acre.*

Carrots are more conveniently raised by forks made for the purpose in this shape,  the prongs being ten inches long, and the space between them two inches at the base, extending to two inches and a half at the points. The bar into which the prongs are fixed should be one inch thick, and extend one inch and a half on the right hand side to tread it into the ground. When the carrots are drawn, they are laid in the same way as directed for the mangolds, leaving a sufficient space clear for carting between the rows. This process requires the strength of men, and the cost varies from fifteen shillings an acre on light land, and in favourable weather, to twenty-five shillings on heavier land, where the roots run deep and come up with much earth attached to them. This operation

* Since this was written, we have seen an account of harvesting roots in the "Agricultural Gazette," by J. M., under date of April 2nd, 1859, which is almost identical with that we have described, the only difference being, that we usually place five rows together instead of four to get a little more room for the carts. We do not find it necessary to have two women cutting to one man pulling. It would seem obvious that one woman would *cut, without handling*, the tops lying in regular rows, while one man was *pulling* and *placing* two rows.

In a previous number of the "Agricultural Gazette," we observed, with some surprise, a statement of Mr. Bond's, that there were instances in his own neighbourhood where crops of mangold, of thirty tons per acre, had been stripped, pulled, and filled into carts, for 3*s*. 4½*d*. per acre. Sure we are there is some great error in the computation of this cost. Mr. Morton gives, in a subsequent number, a very full and clear statement in detail of his experience, and there is no more reliable authority in such matters. Mr. Morton's experience exactly tallies with ours. We were resolved to ascertain what would be a fair price for this work; we therefore had our bailiff amongst the people all the time, *and we looked* on occasionally; and we were satisfied both as to the *ability and* industry of the workers.

should be performed in dry weather, and the roots left two or three days in this state, when the dirt will fall off on performing the next operation. That can be accomplished by women, or boys, or girls. They will pick up the roots, shake off the loose dirt, then top them, dropping all the tops on one heap and the roots on another, alternately along the rows. The tops being valuable food for all kinds of stock can thus be removed, free from dirt, for feeding while fresh, and the roots carted to be stored for winter use.

We usually grow four acres of carrots, primarily for the cart horses and fatting pigs. At this period of the year, when it is necessary to keep the horses highly fed with oats and old beans, about three pecks of carrots cut up with Moody's cutter, or pulped and mixed with the corn and chaff, make an excellent mixture. They are steamed for fatting the pigs, and mixed with the meal of barley or Indian corn, commencing with one pound of meal per head per diem, to be gradually increased to five or six pounds as the animal approaches maturity.

Cabbages require no manipulation. As soon as the pastures and seed grounds fail to supply nutritious food, we fold the male lambs over the cabbages as they stand: they feed them off quite clean down to the hard stem.

Various modes have been recommended of storing mangold. When stored in the field in which it is grown, the safest course is that which we adopt with potatoes. We turn a six or eight-inch furrow over the ground on which the roots are to be placed with the plough, and then throw out the earth for a space of six or eight feet on each side. We then place the roots as *high as they will lie* on such a base; cover with straw *drawn out as for thatching*; then lay a foundation of

earth about six or eight inches thick round the base of the straw while dry; and then proceed to cover the straw to within a foot of the top, that should be left open for a week or two that any moisture arising from the roots may escape.

It will have been seen from our observations in reference to this crop at the sowing season, that we sow a much larger proportion of mangold than has hitherto been adopted in practice. This obliged us to consider of some more commodious and permanent store for it, and at less annual expense than that we have described. Having ascertained, by the aid of posts and rails, the roots could be safely stored in much greater bulk than had been recommended, we selected a spot contiguous to that where the ewes drop their lambs, and also to a road having communication with various parts of the farm. We built two lines of stone walls three feet and a half high, leaving a clear space of twelve feet between them, forty-five yards in length, closed at the end farthest from the road, as a permanent depôt. At eighteen yards from the closed end, on the field side, an opening of three yards wide should be left, and a post fixed on each side of it, and a similar opening further on at the same distance, in order to back in the loads close to the heap in course of formation. As soon as the heap arrives at the first opening, two strong rails are dropped into iron straps fitted on to the posts to support the heap at the openings. The roots are thus thrown up by the hands as fast as they are shot, to the height of the walls, and as much higher as they will lie without rolling off. An occasional load is shot on the outside of the wall to form the roof evenly for thatching. A thick layer of stubble is placed between the roots and the wall; and this roof should be formed

from the inner edge of the wall. The top of the wall being eighteen inches wide, forms a foundation for a coat of dry stubble to be placed over the roots. A coat of thatch completes the store for the winter, leaving the thatch projecting, untrimmed, over the outer edge of the wall. When the storing of the roots is completed in good time, the heap may be safely left for two or three weeks to facilitate evaporation of moisture before the store is thatched. In November it is well to have a little stubble at hand to throw over the store on any indication of frost. The main point is to have the top coat of stubble as dry as possible when the roof is thatched.

The roots when stored will be about eleven feet wide for a height of three and a half feet, and stand nine feet high in the centre of the roof, and we find this store will contain 190 tons of mangold.

The tops should not be cut within an inch of the crown; the roots not trimmed at all; and if put up in dry weather, and covered in dry, this bulk of roots will keep perfectly sound throughout the year.

When the roots have been saved, you will proceed with sowing wheat, and winter beans and peas if you use those crops. Winter beans succeed best on light land, spring beans on heavy strong land. The principal benefit of sowing these crops in the autumn is, that they come off in time, in the following season, to admit of taking a crop of fast-growing turnips immediately after, for which crop we recommend the Red Nottingham, the most productive and useful for the ewes for two months prior to lambing. Ewes should not be put on swedes at that period. During mild weather, *before the close of* October, we strongly recommend *your dipping your* ewes, to destroy all insects; indeed

we dip all the sheep at this season, as they thrive so much better when freed from pests which are a constant source of irritation during the winter and spring months.

Towards the end of this month, look over your live fences, and plant quicksets or blackthorn where required.

Examine the outfalls of your drains, ditches and watercourses, and see there is no impediment to the free flow of water, which may be looked for at this season.

The young clovers and other seeds now demand attention. Tenants are frequently restricted from feeding these in the autumn at all. The more common provision is that they should only be stocked with lambs, and that only in the early part of the month. We supposed these restrictions to have originated in the frequent failure of the clovers. We heretofore fed them very sparingly with lambs, accordingly. The clovers failed to a great extent, nevertheless. We then left a field for a season without stocking at all. The plant of clover looked very promising up to December, when it began to disappear; by the end of March there were but a few patches left, not amounting to an acre altogether in a ten-acre field. We had frequently observed the clover stood best on the land most consolidated, particularly on the headlands. We then tried the opposite treatment, and stocked the seeds heavily with the ewe flock for several weeks in September and October, until they were fed down quite close. At the same time we changed our system of manuring, and instead of devoting the whole of the manure to the root crop, we gave one third to the young seeds the end of October, or *beginning* of November, when the ground was dry on

the surface. We had it thoroughly distributed by women with forks, and afterwards by passing the bush harrow over the ground. We adopted this treatment in every field under young seeds in which we had experienced failures under the ordinary mode of treatment, and the result was a very perfect crop throughout each field. We attribute the regular plant exclusively to the consolidation of the surface by the treading of the ewes, though the luxuriance of the growth was no doubt attributable, to some extent, to the extra manuring.

In the early part of this month examine your boxes or feeding stalls, and yards, your steam engine, chaff cutter, turnip pulpers and cutters, your boilers or steaming apparatus, troughs, baskets, &c. &c., and see that all are in good working order for the winter campaign—threshing, chaff cutting, and feeding at home and in the fields. Lay in your stock of cake, on which you will find some observations under the head of Food.

All horse power which can be spared from the operation of the most pressing nature will now be employed in hauling out manure upon the land in course for the next root crop.

NOVEMBER AND DECEMBER.

DURING these. months the teams will be regularly kept on the wheat stubbles, turning them over, as recommended in October; and if this be diligently followed, taking in hand the heaviest land first, this may be completed in December ready to receive the full benefit of the frosts which usually set in about Christmas.

As soon as that operation has been completed, you will take the ploughs to the fields in which the sheep are feeding off the turnips and swedes, and follow up the folds as closely as possible with a four-inch furrow. See that your shepherd takes his folds the entire length of the field without turning, to facilitate your keeping close up with him.

During these months the two or three labourers you will have not engaged with the horses, nor in any other pressing work, may be usefully employed in paring the margins of your roads and of your fields between the last furrow turned by the plough and your ditches or fences, fertile sources of weeds and couch-grass, to be carted away in frosty weather, when the ploughs are stopped, to the rubbish magazine for spring burning. Stones may be hauled to the roads where out of repair, broken, and placed where necessary. If your roads are well formed in the first instance, sufficiently convex to prevent water lying on them, and you look a-*head to do all* your heavy hauling in dry weather, roads

are kept in good order at a trifling expense, and that is amply repaid by the saving wear and tear to your horses, harness, and implements. With this view, we recommend you to keep a sledge shod with iron, about five feet wide, on which to convey your drags, harrows, &c., backwards and forwards. Messrs. Howard of Bedford supply a very useful shoe, into which the share of the plough fits, with small wheels attached, on which the ploughs run out to the fields, saving both the roads and the soles of the ploughs.

JANUARY.

We should hope you will be so forward with all ploughing as to leave nothing to be done but to follow up the sheep-folds. Your operations will now be concentrated on the barn works, feeding stalls, and preparations for the ewe yeaning, which will be commencing toward the end of the month.

During the frost which usually prevails in this month you will clear out your boxes, stalls, and yards, in order to form your manure heaps as after directed for the autumn manuring. See that all your harness is unbuckled, and well oiled, and in good order. Examine all your implements, and see they are all in good repair and ready for spring cultivation.

FEBRUARY.

In the absence of frost, during which not a foot ought to be permitted on the clovers, the stones on the seed fields may be picked and carried to the roads where any mending is required; and, towards the end of the month, the roller may be taken over the seeds in dry weather.

Should any land in course for wheat not have been sown at the usual season, this would be a favourable time for sowing Talavera, or April, or the nursery wheat, when the land is in a suitable state. At this period a finer tilth is desirable than is required for autumn sowing.

Beans, peas, and oats should be now sown as soon as the land and weather permit; though beans may be drilled with tolerable regularity, and at the least expense, there can be no doubt, however, but dibbling secures a far more regular plant. When hands are used to this operation it can be done at 5*s.* 6*d.* or 6*s.* per acre. Unless your land is in high condition, we recommend for beans a manuring, to be ploughed in, of from 6 to 10 cart-loads per acre, according to the quality of the manure. For the further treatment of this crop, refer to directions for March.

DIRECTIONS

FOR THE

MAKING, PRESERVATION, AND APPLICATION OF MANURES.

PROCRASTINATION is *the* sin of farmers of the old school. If they have ever been successful with a crop sown long after the proper time, in average seasons, they will always tell you of that, and not of the numerous failures from being *too late*. We recommend you to bear in mind, at all times, the maxim of Poor Richard:—"Never to put off to to-morrow, what can be done to-day, for one *to-day* is worth two *to-morrows*." What, you will say, has this to do with manures? We will tell you. It is very important for you to have the right sort of manure, and in the right state, ready at hand just when you want it. To accomplish this, you should have a year's home-made manure in hand—that is to say, sufficient mineral and other dry manures to drill with your root crop in the spring, and sufficient farm-yard dung to manure your seeds and the land in course for the ensuing root crop in the autumn. The former is easily accomplished; the latter will require good management, and, at first, some outlay. It is, however, a grand point to accomplish.

Manure for Spring sowing.—With respect to the manure for the spring sowing, we have adopted the following plan, which we can confidently recommend to your attention. Select some suitable spot, as near as may be to the centre of your arable land, as a depositary

for all the rubbish of your farm. The hedge clippings to form a heap by themselves; the couch, docks, root weeds of all sorts, any parings from the sides of your roads, and the margins round your arable grounds, cabbage, and rape-roots, &c. &c. One or two fields a year thus trimmed will provide you a sufficient quantity of grassy earth for the purpose.

The following judicious observations are extracted from Mr. Haywood's "Letters to Farmers," as applicable to this part of our subject:—"On analyzing a soil a trace of soluble potash is rarely found in it; it exists in combination with silica and clay. These must be decomposed before any potash can be set free for the use of plants. This is accomplished by the agency of carbonic acid gas, produced by the decay of vegetable substances. Every kind of vegetable matter should be carefully preserved and used in tillage, and the soil rendered porous to admit air freely to promote decomposition."

When the dry weather sets in in the spring, we start half a dozen fires at this spot, with the hedge clippings, couch, roots, &c.; and as soon as the fires are established, we lay on, gradually, the grassy earth over each. The first day these will require one man's constant attendance, in adding a little earth at a time until the latter is in a state of combustion. Before the fires are left at night, they must be well covered until there is no appearance of burning through. In the morning they will only require an hour's attention; and if the combustion is proceeding, as it ought to do, very slowly, nothing like smoke should be seen to be issuing from them when left for the day. If the process have been *carefully* managed so far, these fires will only require an *hour's attention* night and morning for some days. *When the heaps* have attained a height at which the *sods will not lie* conveniently without slipping down,

the base may be increased by pulling down the top of the heap all round with iron rakes. The unconsumed outsides are then thrown into the middle of the fires, which are again covered in with fresh sods of earth. These fires are replaced by others until a sufficient quantity of ashes are produced to yield, with the manure to be mixed with them as after mentioned, about forty bushels per acre for the root crop. We have frequently been told, "It is impossible to get such a quantity of ashes on my farm;" we reply, "Follow our directions, and you will be surprised at the accumulation of material in the course of the year."

Our fatting pigs, twenty-four in number, are placed, two together, in boxes eight feet by six, formed with a pit underneath fourteen inches deep. These are covered by spars, three inches wide, with an interval of three-quarters of an inch between each, on which no litter is placed.

These spars should be made of deal, and sent to some place where the sleepers for railways are creosoted by steam pressure, which renders them very durable. The spars are fixed on oak sleepers, excepting as to about one-third of them opposite the door to the box.

The spars are swept over with a broom twice a day, and the fluid and solid excrement is thus deposited in the pit beneath. A layer of the burned ashes is placed in the pits before the pigs are put in. A little spent lime from gas works, if there be any near at hand, and if not, McDougall's disinfecting powder, may be sprinkled over the boards daily with a dredger which he supplies; and at the end of every three or four weeks, burned ashes sufficient to cover the surface underneath an inch or two in depth are swept through the intervals of the *boards.*

By the time the pigs are fat, the vaults will generally be full; about one-third of the spars in the centre of the stye are framed together, so as to take up in one piece, when it is required to clear out the vaults. When the pigs have been sold, and it may be convenient to empty the vaults, we lay out at the rubbish depositary a floor of ashes, about a foot in depth, with a raised margin all round, to prevent the contents of the vaults, which are semi-fluid, from running over, about five yards in width. We then cart away the manure, and shoot it into this tray of ashes. The manure is then covered over with another layer of the ashes. Being near a town, at the mere cost of hauling at night, we occasionally get some loads of night soil, which are deposited in the same way amongst the burned ashes.

A rich heap of manure is thus formed, about the consistence of spit dung, the ashes having absorbed all the moisture. This is mixed ultimately with the great bulk of the ashes remaining in the burned heaps as follows, when there is no pressing work for the hands. One man casts this mixture with a shovel on the adjoining ground cleared for the permanent heap, another divides and scatters this with a fork, while a third wheels the dry ashes to be thrown over the scattered manure; thus gradually forming the permanent heap about fifteen feet wide at the base and as high as it will stand together, until all the dry ashes are disposed of. The heap thus formed, and neatly trimmed so that heavy rains would run off, remains several months. When convenient, in dry frosty weather, this should be turned back at one end, and re-formed, in order that the ashes and manure should be again thoroughly mixed. This is accomplished by cutting away the old heap in thin slices with a spade, and throwing the debris back on the new heap.

When suitable days arrive for drilling your mangolds, swedes, &c., you will then be ready for action, with a guano of your own manufacture which you can depend on to drill with your seed without injury to it. We set up an iron screen, and cast from the ash heap against it, merely to keep back any lumps which would not run readily through the drill; these are afterwards reduced, when dry, by a pat with the spade. The next process is to add the superphosphate. We ordinarily allow two cwt. to the acre, but we recommend three cwt. on land inferior in quality or condition. If we are about to sow, say a five-acre piece, we measure off 200 bushels of the ash mixture, and incorporate with them half a ton of superphosphate.

We have two drills for sowing manures with the seed: the one commonly used for ridge work, with the two concave rollers; the other was primarily constructed by the maker as a broad-cast manure distributer; to this we desired the maker to add three coulters to take on and off: without the coulters, the manure is distributed broad-cast; when the coulters are put on, the manure passes through them in drills immediately in front of the seed, the same as in the roller drill. The primary object of this construction was for the purpose of drilling seed and manure on the flat; but when it may be desirable, from the state of the weather or otherwise, to get over the sowing more quickly, this drill will sow equally well on the ridges, when thrown up to suit the width between the coulters, and we get over three ridges at once instead of two. This drill was made by Smyth and Son, of Peasenhall, Suffolk. The broad-cast distributor is a failure excepting for any manure that is perfectly dry.

Farm-yard Manure.

We consider that where the box system of feeding animals is adopted, and the animals are supplied with litter cut up in five or six-inch lengths, manure will have been made under the most perfect conditions. When the boxes are full at those periods of the year at which manure is required for the succeeding crops, it will be most advantageously disposed of by being transferred at once to the land and covered in.

It has been contended by some agriculturists, that manure required for the root crop should have been previously decomposed by repeated turnings, as turnips, mangolds, &c. feed on carbonaceous rather than on nitrogenous food. Such no doubt is the fact; but it must be borne in mind there is the cereal crop to follow, requiring ammoniacal food, which is developed in the process of decomposition. The ammonia thus generated is absorbed by the soil, and treasured up for the cereal crop, leaving the carbonaceous food for the supply of the root crop.

There will be accumulations of manure requiring removal from the homestead at other seasons at which it cannot be so applied, when it must be stored for future use. The following has been found an effectual and economical mode of accomplishing this, and more particularly when cut litter is used; it saves the cost of repeated turnings, and almost precludes decomposition.

Some three or more spots are selected, according to the size of the farm, in convenient positions for access to the land under tillage, and by the side of the farm roads. The sites fixed on are then excavated about *two feet under the* surrounding surface. In the bottom *is laid some three* or four inches of earth to absorb any

excess of moisture. The manure is evenly spread and well trodden as the heap is forming. As soon as this is about a foot above the ground level, to allow for sinking, the heap is very gradually gathered in, until it is completed in the form of an ordinary steep roof, slightly rounded at the top by the final treading. In the course of building this up, about a bushel of salt to two cart-loads of dung is sprinkled amongst it. The base laid out at any one time should not exceed that required by the manure ready for the complete formation of the heap as far as it goes; and within a day or two after such portion is built up, and it has settled into shape, a thin coat of earth, in a moist state, is plastered *entirely* over the surface. Under these conditions decomposition does not take place, in consequence of the exclusion of the air; or at any rate to so limited an extent, that any ammonia is absorbed by the earth, for there is not a trace perceptible about the heaps.

When heaps thus formed are resorted to in the autumn, either for the young seeds, or for ploughing in on the stubbles after paring for the succeeding root crop, the manure will be found little diminished in quantity, and unimpaired in quality; in fact, simply consolidated.

Decomposition then proceeds within the soil, where all its results are appropriated and rendered available for the succeeding cereal as well as the root crop.

It would be inconvenient to plaster the heap, were the ridge, when settled, above six or seven feet from the ground-level; the base may be formed about ten to twelve feet wide, and the ridge about nine feet above the base, which settles down to about seven feet; this may be extended to any length as further supplies of manure require removal. One man is sufficient to form *the heap;* and it is expedient to employ the same man

for this service, who soon gets into the way of performing the work neatly and quickly. We have been asked where a farmer is to get the earth to cover his heaps? It may be answered, keep your roads scraped when they get muddy on the surface during rainy weather—in itself good economy—and leave this in small heaps beyond the margin of your roads. This, in the course of the year, will be found an ample provision for the purpose, for it is unnecessary to lay on a coat more than one or two inches in thickness, which should be done when in a moist state. The soil left on cleaning the roots for the stock at the stores will contribute much for this purpose.

Farmers who have not been in the habit of bestowing care on the manufacture and subsequent preservation of their manure, and watching results, have no conception of the importance of this. A barrow-full of such manure as has been described, would produce a greater weight of roots and corn than that so graphically described by the most talented and accomplished of our agricultural authors, as the contents of "neighbour Drychaff's dung-cart; that creaking hearse, that is carrying to the field the dead body whose spirit has departed."

We believe that a great deal of money is annually wasted by farmers in the purchase of manures. Adulteration is a fruitful source of loss: few of them have permanent effect. Dr. Voelcker, in his very useful paper, "On the agricultural and commercial value of some artificial manures, and on their adulteration," has well observed, that "the effect which a manure is capable of producing on vegetation, it is evident, mainly depends *on its constituents*; and as the composition of *the various fertilizers* usually employed for restoring the

impaired fertility of land greatly varies, their effects on vegetation necessarily must vary likewise considerably. In well-made farm manure all the elements are found which are required for the healthy and luxuriant growth of all the different cultivated plants. Practical experience having shown that all the different kinds of vegetable products can be greatly increased by the application of farm-yard manure, it is justly esteemed as a *universal* manure."

As a general rule, we believe that a true economist, in the widest sense of the term, will neither find it necessary nor advantageous to cast his money into the manure market, now so abundantly supplied. If he will take care that every constituent of manure on his farm is carefully husbanded, and judiciously distributed, and at suitable times, thorough tillage will do the rest. We refer exclusively to arable land, and can only admit one exception,—viz. superphosphate of lime for the root crop. There are, no doubt, farms so peculiarly situated with reference to the homestead and yards and other circumstances—for instance, those on which there is poor land lying at a considerable distance, and at a comparatively elevated position—on which good guano or other portable manures may be economically employed as compared with hauling from distant manure heaps; but in such cases we think sheep will generally be the best resource.

In order to test the comparative values of manure made in boxes and in open yards with sheds, the animals in both cases being in course of fattening for the butcher, we sent a portion of the manure from our boxes, and another taken from a farm in which the animals were tied up, (the manure from the stalls had *been heaped* in the yard in the usual way,) to the

Agricultural College to be analyzed. The following analysis was sent to us by the chemical professor:—

	Box Manure.	Yard Manure.
Water	71·04	71·00
Nitrogenized matter capable of yielding ammonia, 100 parts dried .	2·37	1·07
Salts soluble in water containing organic and inorganic matter .	10·07	4·06
Organic	5·42	1·82
Inorganic	4·28	2·78
Phosphoric Acid . . .	0·03	0·26
Potash and Soda . . .	2·00	0·08

The superiority of the box manure exceeded our anticipation; and if such be the result when both specimens were taken prior to decomposition, you may in some degree estimate the further deterioration which must result from the exposure of the heaps formed in fields, unprotected from heavy rains washing out the soluble, and therefore the most valuable constituents.

At a subsequent period we were desirous of obtaining a quantitative analysis, in more detail, of manure taken from our boxes; also of the mineral matter contained in it; and a comparative estimate of the proportions of straw and dung; and we therefore sent a portion of the manure to Professor Way for this purpose, taken from a heap which had been formed on emptying the boxes, and covered over with earth in the mode we have recommended elsewhere to your adoption. A copy of the Professor's analysis will be found in the Appendix. We should observe, that heap had been formed without any admixture of salt.

In two or three instances in which the box system of feeding has not answered the expectation of the owners, *we have found on* inquiry that long straw had been em*ployed for litter.* That is a fundamental error. The si-

licious coat of straw is non-absorbent; but when crushed, and cut into short lengths by the chaff-cutter, it readily absorbs moisture. In boxes in which long straw has been employed, we have seen fluid rise palpably to the surface on the pressure of the weight of a bullock, and their sides quite wet on rising after lying down. We have never seen any thing of the kind in our own boxes; nor, on their being emptied, have we ever seen any fluid drop from the carts; the manure is in a sufficiently moist state throughout, and nothing more. On the bottom, before the animals are put in, we place a few inches of the waste from the threshing-machine, or saw-dust; afterwards, the cut litter is sufficient to absorb the urine of the animals.

We caution you especially against the practice, which you will see adopted in all parts of the country, of carting out manure as it accumulates at the homestead, from time to time, to form heaps in the fields, to which it is ultimately to be applied, and left in a more or less consolidated state exposed to the weather. Under such circumstances, fermentation takes place which generates ammonia. This, to some extent, escapes in the shape of gas; but this, to a much greater extent, together with the more soluble, and therefore more valuable, constituents of the manure, is washed out and wasted by rain falling on manure heaps so carelessly formed.

We shall give you in the Appendix the tabular results of some experiments conducted by Dr. Voelcker on Farm Yard Manure; but you should procure his "Four Lectures on Farm-yard Manure, Artificial Manures, Barren and Fertile Soils, Oil-cakes," &c., published by J. Ridgway, of Piccadilly, which we consider the most *valuable contribution* to the farmer's store of practical *knowledge* which has hitherto appeared.

DIRECTIONS

FOR THE

ECONOMICAL FEEDING OF STOCK.

We have considered it the better arrangement to give you our views on this part of our subject under a separate head, rather than interrupt the regular sequence of our agricultural operations.

We have already stated that our farm consists of 196 acres of arable land, and of 64 acres of old pasture. By the system we have adopted, as explained in the foregoing pages, our live stock has been considerably increased since we entered on the occupation eleven years ago.

Our horses, in regular work, are nine; four pair-horse teams, and a brood mare for odd jobs, and we generally have three or four colts. We have usually ten or a dozen calves, heifers, and steers, chiefly bred from our home dairy cows, which go into the boxes to fatten at three years old. Our flock, on an average, comprises 500 head, and we yean about 180 ewes, though not quite so many at present, as we are changing our flock in some particulars.

We fatten, as a general rule, 24 bullocks every winter in our boxes, and the same number of pigs, also in boxes. We may observe, our horses are also kept on *that system.* Such is our average live-stock in the *course of the year.*

We give you these data, as they actually exist, to *nder our account* complete, and not as indicating an

fixed relation between acreage and stock; for the quantity, and the kinds of stock that can be profitably maintained in reference to the acreage of a farm, will vary almost in every particular case. The natural quality of the land, the relative proportions of arable and pasture, the condition in which it is, and other considerations, will materially influence the kind and quantities of stock it will maintain. The safe course is to keep well within the estimated means of maintenance. Avoid any risk of short commons, and keep all your stock above, rather than under the mark. The young stock, more especially, should never know want from their birth to maturity.

On such a farm as we have described, in respect of soil and subsoil, indeed on almost any thoroughly drained arable land, the land is better, more effectually, and more economically manured by sheep than by any other description of stock. Furthermore, that is the most manageable and the most profitable stock. We therefore recommend your keeping as large a flock as you can well supply with food at all seasons of the year. Your capabilities will be most severely tested between the end of July and the period at which you can fairly enter upon your turnip crop, and from the consumption of that crop until your grass and tares are of sufficient growth in the spring or early summer. On commencing turnip feeding, you will do well to bear in mind that early spring feed is the exceptional case in this country; that cold, ungenial weather, far into May, is very common; and that you will rarely get abundant keep till after the middle of that month. For six or eight weeks preceding that date, a good store *of mangolds* will be found invaluable.

To meet the exigencies of dried-up pastures, and the *breaking* up the seed quarter in good time, in the

early autumn, we strongly recommend cabbages as a very useful and highly nutritious food, the cultivation and subsequent management of which we have before described. Cabbage yields a larger proportion of flesh-forming matter than any other root grown as food for stock, all being reduced to the dry state previously to examination.

With respect to the breed of sheep to be selected for your flock, you will hear a variety of opinions, for some sheep are most profitable in one district, some in another; and you will generally adopt a prudent course in selecting that variety which is found to prevail in the locality in which your farm may be situate, for the selection of which good reasons may be assumed to have existed.

Our system has been to use the Cotswold ram with the Down ewe; whether Southdown, Hampshire, or Shropshire-down, may depend on special circumstances. The advantages, as they have appeared to us, from this cross, are that you get a greater weight of mutton, and double the quantity of wool, which the pure Down produces, and that you get the same price per stone, practically, for the mutton, and very nearly the same price per lb. for the wool, and with an equally ready sale.

Instead of adhering to this first cross between pure bred animals, we followed up breeding for two or three years from the cross-bred ewe, thus:—When the ewes to be put to the rams had been selected, they were again examined; and those in which the characteristics of the Down predominated were turned with the Cotswold rams, and the rest turned with the Down dams. We mention this, not for your adoption, but for your avoidance; for we found, after two or three years, the stock *degenerated; and* we deemed it expedient to fatten off

the flock, and lay in a new stock of pure Southdown ewes to be put with Cotswold rams. We shall shear and fatten the produce, and replace turned-off ewes by purchase.

We have frequently seen ewes called the *scavengers* of the farm. However useful they may be in eating down the rough grasses in the pastures, &c. in the autumnal months, it is a great mistake to carry this on too long. If you desire strong healthy lambs, after the first two months of gestation, the ewe must have generous treatment, and plenty of nutritious food, in the shape best adapted for ready assimilation. Swedes are not considered a suitable food for ewes in lamb. Cabbages and hybrid turnips are preferable; and the more intimately these can be mixed with good chaff the better, with which they should be well supplied. We hear a good deal about *bad luck* with ewes. We are no believers in *luck*, but have great faith in *management;* and we have no doubt but, in nineteen cases out of twenty, death and abortion are the results of injudicious feeding and want of due care. During the ewe yeaning those with double lambs should be kept apart from the others, as they will require extra nourishment. We give these bruised, equivalent to a pint of entire oats daily. We do not use any straw in preparing the chaff for ewes with lambs.

The *feeding* of animals is a very extensive subject, and one of vital importance in reference to profit. Farmers have never experienced any difficulty in putting on their animals plenty of flesh and fat in more or less time. This has been, heretofore, and it is to be feared still is, with many of the older farmers, a haphazard process, and not founded on true economical principles. It is only of late years, since the peculiar

structure of the digestive apparatus of our various animals has been more studied and better understood, and since we have had the advantage of learning by the analysis of our chemical professors the various constituents of the frames we have to build up, with relation to the various products they were desired to supply, and of every description of food presented to our choice, that it has been practicable to proceed on any sound economical principles.

In the selection of food for your various stock, whether for feeding on your farm, or preparing for the market, you will in the first place consider the object you have in view, as respects each particular animal or set of animals. Take your cattle, for example. The young growing stock must be supplied with food productive of flesh and bone in excess. An animal at maturity in point of age and flesh, demands food in excess calculated to produce fat. Cows fattening calves, or kept for the purpose of making butter or cheese, will require a different description of food. Sheep, whether in a growing state, suckling lambs, or feeding for the butcher, require different treatment as respects food, and so of other animals.

Dr. Voelcker has so well and so concisely classified the various elements of the food of animals, and the special purposes each is destined to fulfil in the animal economy, that we cannot do better than give you his summary, contained in his most useful pamphlet on "The Chemistry of Food," which should be in the hands of every farmer.

"1. The earthy substances contained in food (that is, the ash left on the combustion of any article of food), consisting chiefly of phosphate of lime and magnesia, present the animal with the material of

which the bony skeleton of its body principally consists; they may be called therefore *bone materials.*

"2. The saline substances, chlorides of sodium and potassium, sulphate and phosphate of potash and soda, and some other mineral matters occurring in food, supply the blood, juice of flesh, and various animal juices, with the necessary mineral constituents.

"3. Albumen, gluten, legumin, and other nitrogen-containing principles of food, furnish the animal with the materials required for the formation of blood and flesh; they are called, therefore, *flesh-forming* substances.

"4. Fats and oily matters of the food are employed to lay on fat, or to support *respiration* and *animal heat.*

"5. Starch, sugar, gum, and a few other non-nitrogenized substances, consisting of carbon, hydrogen, and oxygen, are used to support respiration (hence they are called elements of respiration), or they produce fat when given in excess.

"6. Starch, sugar, and other elements of respiration alone, cannot sustain the animal body.

"7. Albumen, gluten, or any other albuminous matter alone, does not support the life of herbivorous animals.

"8. Animals fed upon food deficient in earthy phosphates or bone-producing principles, grow sickly and remain weak in the bone.

"9. The healthy state of an animal can only be preserved by a mixed food, which contains *flesh-forming* constituents as well as *heat-giving* principles, and earthy and saline mineral substances, in propor-

> tions determined by experience, and adapted to the different kinds of animals, or the particular purposes for which they are kept."

We may add, as further introductory to the tables we propose to give in the Appendix illustrative of this division of our subject, that albumen and casein, which comprises gluten and fibrin, the *nutritious elements* of food, are composed of carbon, hydrogen, oxygen, and nitrogen in the same proportions, and in point of composition are identical with flesh and blood; and that the *heat-giving* and *fattening* elements do not contain nitrogen.

It has been computed that a healthy man, under ordinary circumstances, inhales 3000 gallons of air in the twenty-four hours. This is brought in contact with the carbon in the lungs, and consumes it, giving out the required heat. The result passes out of the mouth in the shape of carbonic acid gas, just as it passes into the chimney to an open fire, in which charcoal had been consumed.

We never could reconcile with our views of the animal economy the system we found to be universally adopted, of feeding sheep through the winter months almost exclusively on roots, containing on an average ninety per cent. of water, and of giving bullocks in stalls enormous quantities of the same neat roots. We stated our views on this subject in a paper to the Royal Agricultural Society, which appeared in their Journal in 1855. It will be found in the Appendix, as you may not have the Journal to refer to.

Having now shown you the various elements of the food of animals, and the purposes in the animal *economy to* which they severally contribute, you may

naturally ask "How am I to learn the composition of the various feeding stuffs presented to my choice, to enable me to select those best adapted to my special purposes?"—The answer is, that every article of food used by farmers has of late years been analysed by many chemists; and we will give you in the Appendix a selection from such analyses, of which we have taken notes from time to time, which will show you at a glance those which are best suited for particular purposes in point of composition. These analyses may be considered as the grammar of feeding, and demand careful consideration; but you will be aware that to almost all grammatical rules there are many exceptions. Close observation, and much experience are required to make a very successful feeder of animals, with all the aids which science has provided. Animal nutrition is a mysterious process, and with all our knowledge derived from the *chemical* laboratory, we do not yet know what transformations may be effected in the *animal* laboratory.

Before we leave this division of our subject, we cannot too strongly enforce the economy of having all the food for your animals reduced to a state in which it is most easily masticated and most readily digested. Having stated elsewhere (see Appendix) our views as to the reduction of roots, and the importance of an intimate admixture of solid food being given with them, we now refer more particularly to hay and straw. When we commenced farming we were much struck at the consumption of hay. The carter "was sure he never wasted a bit,—the cowman and the shepherd were always at the rick." The shepherd "was uncommon careful; he never had a bit but on a frosty morning for the ewes—he could not be answerable for the carter and

the cowman." The latter repeated the same story. We then started Cornes' chaff-cutter, adapted for steam power, and passed a law on the farm that no rick should be tapped without our express order, and that no hay should thenceforward be used on the farm until cut into chaff. Previously to this, the stock of hay was exhausted long before Midsummer, and in some instances we had to purchase to carry the horses on till the new crop was ready. Now, with a larger stock, we have eighty tons of old hay in hand after the year's consumption. The waste of hay, when given at large, by horses, cattle, and sheep, is enormous.

As our regular working horses, nine in number, have for many years been in perfect health and condition, and well up to the work required of them, of which our veterinary surgeon's bills—having amounted during the last ten years to exactly 12*l.*—afford conclusive evidence, we will state our mode of feeding and treatment of them.

We have already stated that we keep them in boxes, nine feet square, and fourteen inches under the level of the surrounding ground; four on one side, and four on the other side of a three feet path down the centre. The boxes are divided by boarding, about three feet above the bottom, to prevent the horses getting their legs under the divisions when lying down or rolling, with spars above sufficiently high and near together to prevent their getting their heads over or through to their neighbours. With this limitation, the boxes form one large room, in which the horses, being social animals, enjoy the society of the family circle. Each horse has a box to himself, in which he is no otherwise confined, and he may lie in any position which suits his fancy. They *are littered daily* with straw cut up by the chaff-cutter

in about six-inch lengths, and the boxes are emptied once in six weeks, on an average. Before the fresh litter is put in, the moister portion in the box is placed towards the corners, and trod down, and the drier portion transferred from the corners towards the centre. The treading and lying of the horses consolidates the under surface, and to a great extent prevents decomposition, and the boxes are therefore almost free from that pungent effluvia so painful and noxious in ordinary cart-horse stables. There is no more comfortable roof for stables than thatch; but as slates are now almost universal, we recommend an internal coating of straw, which is very easily contrived by means of thatched hurdles, made of a length to lie between the side pieces of the roof. These will last a great many years, and may be taken down and fresh lined with straw if required. Without this precaution, slate roofs are very hot in summer, and very cold in winter. This arrangement obviates that which we found a serious objection to the slate roof:—when the stables were closed in cold winter nights, the vapour from the horses condensed on coming in contact with the cold slates, and then dropped back on the horses. The boxes are open to the roof, in which there are four lights, which open by a bracket to any extent required for ventilation. The doors to each box have attachments at the top to brass pulleys running backwards and forwards on an iron bar fixed above. This is an economical arrangement, as the doors are never out of order.

With respect to feeding, beginning with the autumn, during the ploughing for wheat, which is comparatively light work, we begin to increase the more nutritious food. During August and September we gradually diminish the green food, and give crushed oats equi-

valent to a bushel and a half of neat oats per head per week, with mixed hay and straw chaff *ad libitum*.

Some months back, there were some instructive experiments recorded in the "Agricultural Gazette," which had been made by the omnibus proprietors in London. They established the fact, that a much smaller quantity of oats, when bruised, maintained their horses in as good working condition as the larger quantity given entire. You must bear in mind, nevertheless, that there is a material difference between a given *measure* of the one and the other. We have found a bushel of oats, of the weight of 38 lbs. the bushel, when filled with the same sample which had been well crushed, to weigh 22 lbs. only.

The horses are fed the first thing in the morning, again at midday, and again at night. The carter gives at each feed about half the allowance to each horse in the first round, and the rest when that has been consumed. During October, November, and December, while the deep cultivation is going on for the root crop, we give, in addition to the oats, half a bushel per head per week of old beans passed through the crusher, and a peck of pulped carrots mixed with the chaff and corn, which counteract the more stimulating food. We find that a judicious admixture of green food during the summer, and carrots during the winter, with the dry and more stimulating foods, upon the principles stated in the article to be found in the Appendix, obviate the necessity for bleeding and physicking, which are of very rare occurrence in our practice. From about the middle of December, we withdraw the extra half bushel of beans, and increase the allowance of carrots. During March, April and May, we give crushed oats *equivalent to two bushels* of entire oats per head per

week, and when the carrots are consumed, we cut up rye and other green food with the chaff and corn. From May to August we reduce the allowance of oats to one bushel per head per week, and increase the green food, which is cut up and mixed with the chaff.

Though we have mentioned oats as the ordinary food for horses, we give barley and oats, indifferently, as the relative prices, having reference to the different weights per bushel, indicate the more economical use of the one or the other. They often bear the same market price per quarter; then, as the relative weights may be taken on an average at forty pounds for oats, and fifty-four pounds for barley, we should use barley. When we adopt barley, we previously soak it in water until it sprouts, and we give it to the horses in that state, and the horses thrive well on it. There is no end to the recipes for the feeding of cart-horses, both as respects quantity, quality, and cost, as you will see on reference to the very able and interesting article of Mr. Morton in the 42nd number of the "Journal of the Royal Agricultural Society" on "Horse-power," in which a vast deal of information has been collected on this subject. We give you the mode of treatment we adopt, simply as one which has maintained our horses in perfect health and condition. During eleven years we have only lost one horse, which was bought, in apparently good health, in London, and died within a week after it reached our farm, in a mad state from an inflammatory attack, the cause of which no doubt preexisted, or possibly from more or less exposure on the journey, after leaving a close, hot, London stable.

The large-framed, heavy, hairy-legged English cart-horse is inadmissible on a farm on which progress is the order of the day. The days of four and five of such

animals at length in a plough, and of yet more oxen, diversified with an occasional cow or a bull, though not quite passed, are numbered. The most economical and satisfactory course is gradually to raise a stock of horses by breeding them yourself. At the end of the London season you can pick up at a cheap rate amongst the job masters a well-bred, powerful, roomy mare, with a good head, loins and quarters. Such an animal we should put to a clean-legged Suffolk, Clydesdale, or other cart stallion; or we put a cart mare to a thorough-bred stallion. In either case you get a much more active serviceable animal, and teams which it is a pleasure to see in work.

Be especially careful in the selection of your head carter. The condition, health, comfort, and usefulness of your stud depend more on this than any one would believe who had not accompanied experience with careful observation. He should have a fine temper, be very quiet and gentle in his treatment, possessed of good common sense, desirous of information, able to get at it by reading, and fond of horses. No swearing, or hollaing, pulling about the mouths and heads of the horses, must be permitted. Such an example is most influential with the men and boys under him. Horses are very intelligent animals. Mr. Rarey has well observed, they are ready to do all that we require of them, the only difficulty is to inform them that which we do require. We know from experience that such information is very soon conveyed to young horses by a good carter, by signs inaudible to a stander-by. Mr. Rarey's little book should be placed in the hands of the carter and those under him.

HINTS

FOR THE

SELECTION OF INSTRUMENTS.

THE progress which has been made during late years in the application of steam power to tillage, and the relative cost of steam and horse-power, upon which so much light is thrown from day to day, will henceforth demand much consideration on entering farms, before a selection of power and implements can be economically resolved on.

On any farm containing 200 acres or upwards of arable land, we assume the economical necessity of a steam engine, of more or less power according to circumstances. Assuming the use of steam power for tillage not to be contemplated, in all cases in which the farm buildings are conveniently situated near the centre of the farm, we should recommend a fixed engine at the buildings, as the most effective, and by much the least expensive to keep in good working order. On farms so circumstanced with reference to the buildings that a considerable proportion of the corn and grain cannot be economically brought to the homestead, a locomotive engine would be preferred. In all cases in which tillage by the aid of steam power is in contemplation, the locomotive engine must necessarily be adopted.

Before you purchase a steam engine for any purpose, we recommend you to examine the report of the Judges on which the award of the 500*l.* prize offered by the Royal

Agricultural Society was founded, and to consider the communications, now of frequent occurrence, of the experience of those who have embarked in the use of this power, in the "Agricultural Gazette," and other agricultural periodicals. We consider the economy and superior efficacy of this power on farms of a certain extent, comprising clay subsoils, and aluminous surface soils, and on which the enclosures exceed ten acres, already firmly established, more especially in those cases in which a locomotive engine would be required independently; and the ploughs, or other instruments adopted, with the requisite tackle, would be the only extra outlay.

Taking 200 acres of arable land as an assumed quantity, you would require five ploughs; the greater number calculated for light, or for heavy land, as best suited to your particular occupation. Iron wheel ploughs of the best construction have been proved to be lightest in draught, though specifically heavier than wooden ploughs. They should have steel turn-furrows, and be furnished with skims, and for stony or gravelly soils, with wrought iron shears. They are more steady in their work, and most easily managed in unskilled hands, when properly adjusted. As a general rule, the width of your furrow-slice should be, to the depth, as 7 to 5. There are now so many good makers, that it would seem almost invidious to name individuals—the report of the Judges at the coming annual meeting of the Royal Agricultural Society at Warwick, at which prizes will be awarded for this class of implements, will be a safe guide.

Hart and Co. of Wantage make a very useful implement as a cultivator for deep tillage, which, by exchanging the tines for shears provided by them, pares the *stubbles after harvest* quite as well as Bental's broad share,—*for we have* used both; Hart's is a scientifically,

well-constructed implement, at a moderate price, and answers the purposes of paring and deep cultivation equally well.

As a cultivator, when less depth is required, and yet a deeper stirring than can be accomplished by the heaviest drags, there is an implement made by Cambridge of Bristol, for four horses, having three rows of tines (six in the front and middle rows, and seven in the hinder row), about sixteen inches in length, and curved forwards at the points, for which we find frequent use for stirring land in the spring, which had been ploughed in autumn, and which will prepare the land for the seed as well, and in much less time than the plough, as it covers eight feet of ground at a time. There are however particular states of the land in which a ploughing is necessary. A set of Howard's patent jointed harrows, ten feet wide, calculated for three horses, and a lighter set for a pair of horses, will complete your implements for preparing the seed-bed. We find Crosskill's clod-crusher, and his improved Norwegian harrow very useful in certain states of weather, and recommend them as extras, when outlay is not necessarily restricted within narrow bounds. The former is the most efficient implement we know for rolling wheat in the spring on light land.

Ransom's U. L. J. plough is the best double-mould-board plough we have seen for forming the land into ridges for the root crop. The turn-furrows may be removed, leaving the sole finished with a spear head, for hollowing up the spaces between the ridges, as recommended in August; and there are irons supplied with the plough, to be fastened across the beam at the base of it, and at right angles, which pare down the sides of the ridges, while the share hollows up the bottom of the furrow.

Horse-Hoes.—We consider Garrett's to be absolutely essential. It is applicable to every crop, whatever may be the distance between the rows, from nine inches upwards. We have had ten acres of wheat hoed with this hoe in a day, with one horse, a man, and a boy to lead. Barley, drilled at nine inches, may be safely hoed, always assuming these crops to have been sown with a drill having the fore carriage steerage attached. The axle of this hoe, and of your corn and seed drill, should be of equal lengths, so that the wheels of the one will follow those of the other.

There is another very useful horse-hoe, made by W. Smith of Kettering, near Northampton, which will cover five rows of wheat at nine inches apart, three of turnips at eighteen inches, and two at twenty-seven inches apart. This costs rather less than half that of Garrett's, and is a cheap and effective implement as an auxiliary to the latter, or in lieu of it, when the former cannot be afforded. Garrett's is by much the most effective implement, as being adapted for use on land in every shape, as well as to every variety of crop. On level ground, or where the crop lies across fields which are set up in ridge and furrow of moderate elevation, Smith's is a useful and efficient implement.

You will require, in addition, two single expanding hoes for the root crop, with hoes for cleaning, exchangeable for tines to stir the intervals, after the hoeing has been completed, as heretofore described in the calendar for August. We know none so light, handy, and effective for these purposes as some we have had constructed for our own use by Robert Lane, an agricultural implement maker of Cirencester.

Drills.—You will require a two-row ridge drill, with *concave rollers, to sow* turnips and mangolds on the ridge *system with manure,* also a corn and seed drill. This is

often made in combination with an apparatus for sowing manures with the seed; but such drills are very expensive and complicated, and we much prefer, independently of the corn and seed drill, a third, such as we have before referred to, as made by Smyth and Sons, especially if they should have adopted a better plan of distributing the manure broad-cast. Before you select your drills we refer you to the Appendix to the 18th volume of the "Journal of the Royal Agricultural Society," page 30, where you will find a description of the drills to which prizes were awarded at the Salisbury meeting.

Cornes' chaff-cutter, adapted for horse or steam power, has been awarded the first prize at the Society's meetings for several years. It is a first-rate machine, to which is attached various wheels, by means of which you may cut chaff at various lengths for feeding purposes, and straw in 5 or 6-inch lengths for litter, which is a great advantage.

There is a very useful cutter made by Dyball of North Walsham, an improvement on the older chaff-cutter by hand, which is cheap and convenient near the stables for cutting up rye or other green food to mix with the chaff for the horses, also to cut chaff in smaller quantities when steam power may not be required. A lad, when accustomed to the movement, can cut up food for all the horses in a short time and with much ease.

Samuelson's gardener's root-cutter is in universal use, and your shepherd will hardly be satisfied without a couple for field use. We much prefer that made by Carson of Warminster, which cuts the roots in very thin ribbons, which can be more intimately mixed with the chaff. Upon the same grounds, we prefer Bental's pulper to either, though at greater expense of labour. We consider that a very perfect and simple implement

for the reduction of roots. The advantage of a thorough incorporation of roots with the drier food, to which we have elsewhere adverted, is found so great in practice, that we believe the pulpers will eventually supersede the cutters. Bental's machine should always be furnished with a handle at each end of the axle. It requires two pairs of hands for continuous working, to feed many mouths daily. If you can so place this machine with reference to your steam-power, that you can put a strap over the wheel while your engine is at work, it would be a great advantage.

There is an apparatus for dipping sheep to be had with or without wheels, made by Mr. Bigg, of Great Dover Street, Southwark, consisting of a dipping tub, drainer, and inclined plane, which you will find very useful for the purpose.

Before you determine on the selection of the more expensive articles — steam engine, and combined steam threshing-machine, with the various additions requisite to prepare your corn for market — you will do well to study the report on the exhibition and trials of such articles made at the Chester meeting of the Royal Agricultural Society, which you will find in the latter part of the 19th volume of the Journal, with every necessary detail, together with the prizes awarded.

In conclusion, we caution you against the error, too prevalent heretofore, that agriculture is an occupation adapted to the meanest capacity, a convenient refuge for any individual of a family not blessed with the requisite talent for more intellectual pursuits. We deem it a pursuit of the utmost importance to mankind, a *science* that has been unaccountably left behind while others have been prosecuted with extraordinary success. *The great increase* of our population since the beginning

of this century, and their steadily increasing power of consumption of superior food, from a higher rate of wages for labour of all kinds, rendered imperative increased production, and importation of the produce of other countries, and led ultimately to the abandonment of all restrictions upon such imports. This was regarded as utterly destructive of the agriculture of this country by a very large section of the occupiers of the land: on the contrary, the result has been a most rapid improvement in every department of agriculture; it has been elevated from a state of mere empiricism into the rank of a science; and there is good reason for the belief, taking into account all the produce of our farms, that produce has been doubled in the course of the present century.

We believe the best of us are mere tyros in this science, and that it is in a state of progressive development. Intercommunication is a means of instruction we recommend to you. Avail yourselves of the great facilities of locomotion, inspect farms of reputation for successful management in other districts, and be inquisitive for the reasons on which have been founded practice which may be new to you.

You will find "Blackie's Cyclopædia," edited by Mr. Morton, a very useful book of reference while you are acquiring experience; and you should procure and study Dr. Voelcker's small treatises on "Manures, and their Adulterations," "On the Chemistry of Food," and his "Lectures on Agricultural Chemistry." You should also become members of the Royal Agricultural Society, at the moderate cost of a guinea per annum, which entitles you to the Journal of the Society, from which you will derive early and authentic information of improvements in practice, and of the progressive developments of science.

APPENDIX.

TABLE I.

SHOWING THE NUTRIENT VALUE OF 100 LBS. OF VARIOUS ARTICLES OF FOOD, AS COMPARED WITH 100 LBS. OF ORDINARY HAY.

	Dry Organic Matter, or Real Food.	Water.	Ashes.
	Lbs.	Lbs.	Lbs.
100 lbs. of Common Hay contain .	76½	16	7½
„ Linseed Cake . . .	75½	17	7½
„ Peas	80½	16	3½
„ Beans	82½	14	3½
„ Wheat Straw . . .	79	18	3
„ Barley Meal . . .	82½	15½	2
„ Oat Meal	89	9	2
„ Bran	81	14	5
„ Oats	79	18	3
„ Lentils	81	16	3
„ Potatoes	27	72	1
„ Red Beet	10	89	1
„ Turnips	10	89	1
„ Swedes	14	85	1
„ White Carrots . . .	12	87	1
„ Mangold Wurzel . .	10	89	1

TABLE II.

SHOWING THE RELATIVE VALUES FOR FEEDING PURPOSES OF THE FOLLOWING FOODS.

	Linseed.	Oil-cakes	Lentil.	Barley.	Oats.
Water . .	9·2	10·07			
Husk . .	8·9	12·69	18·7	14	23·7
Starch, Gum, &c. .	35·3	36·25	32·8	68	46·1
Gluten, Albumen, &c.	20·3	22·26	38·5	14	13·7
Fatty Matter . .	20·0	12·38	9·1	2	6·7
Saline, Ash, &c. .	6·3	6·35	3·9	2	6 sugar 3·8 gum
	100·0	100·00	100·0	100	100·0

TABLE III.

SHOWING THE PROPORTIONS OF NUTRITIVE AND FATTENING MATTERS IN 100 PARTS OF VARIOUS ARTICLES OF FOOD.

	Dry Nutriment.	Heat and Fat-producing Materials.
Lentils	25·00	45·25
Beans	23·30	48·46
Peas	23·40	50·07
Linseed	22·60	84·00
Linseed Cake	31·40	66·00
Wheat	20·82	50·38
Oats	13·60	55·48
Barley	13·21	56·14
Rye	13 81	61·03
Indian Corn	10·70	72·08
Red Clover	10·30	60·80

TABLE III. — *continued.*

	Dry Nutriment,	Heat and Fat-producing Material.
Meadow Hay	8·01	66·48
Rice	5·43	80·36
Wheat Straw	1·85	26·27
Barley Straw	1·70	49·81
Oat Straw	1·80	43·92
Mangold	2·05	14·88
Carrots	1·88	13·73
Swedes	1·62	10·35
Turnips	1·53	9·94
Potatoes	2·43	21·87

TABLE IV.

SHOWING THE PROPORTIONS IN THE PRODUCE PER ACRE OF FLESH-FORMING AND FATTENING MATTERS IN VARIOUS FOODS.

	Fattening Matters.	Flesh-forming Matters.
Wheat	1,185	489
Wheat Straw	1,629	72
Barley	1,179	277
Barley Straw	1,673	57
Oats	1,491	365
Oat Straw	1,180	48
Swedes	4,637	725
Carrots	6,141	840
Mangold	10,000	1,377
Peas	1,374	642
Beans	1,330	639
Potatoes	4,898	544

TABLE V.

ANALYSIS OF 100 PARTS OF EACH OF THE FOLLOWING ARTICLES.

	Bran.	Beans.	Lin. Cake.	Rape Cake.
Water	12·85	15·84	12·44	10·68
Oil	5·56	1·59	12·79	11·10
Albumen	13·80	24·70	27·69	29·53
Ash	6·11	3·36	6·13	7·79
Other constituents . .	61·68	54·51	40 95	40·90
	100·00	100·00	100·00	100·00
Phosphate of lime . .		49	2·73	3·87
Phosphoric acid . .	3·00	3·46	55	39

—ANDERSON.

TABLE VI.

SHOWING THE AVERAGE COMPOSITION OF OIL-CAKES.

	Linseed Cake.	Rape Cake.	Poppy Cake.	Cotton-seed Cake.	Mustard Cake.
Moisture . . .	12·44	10·68	11·63	11·19	11·90
Oil	12·79	11·10	5·75	9·08	6·69
Nitrogenised or flesh-forming principles	27·28	29·53	31·46	25·16	23·48
Substances not containing nitrogen:—					
Heat-giving substances	41·36	40·90	38·18	48·93	52·14
Mineral matters (ash)	6·13	7·79	12·98	5·64	5·79
	100·00	100·00	100·00	100·00	100·00

TABLE VII.

SHOWING THE COMPOSITION OF THE FOLLOWING CEREALS.

	Wheat.	Oats.	Barley.	Indian Corn.
Water	12·26	13·09	14·65	14·96
Flesh-forming constituents .	11·64	11·85	10·84	11·27
Heat and fat-producing substances . . .	68·74	63·34	68·31	67·48
Woody indigestible fibre .	2·61	9·00	3·45	5·02
Inorganic matters (ash) .	1 75	2·72	2·75	1·27
	100·00	100·00	100·00	100·00

—VOELCKER.

We give the following *Analysis of the Potato*, as affording conclusive evidence of the unfitness of this favourite food of the labourer for the construction of that muscular power on which his value so materially depends: —

Water	75·2
Flesh-forming materials . . .	1·4
Starch	15·5
Dextrine	0·4
Sugar	3·2
Fat	0·2
Fibre	3·2
Ash	0·9
	100·0
Flesh-forming materials . . .	1·4
Heat-giving materials . . .	22·5

TABLE VIII.

SHOWING THE RELATIVE PROPORTIONS OF FLESH-FORMING, HEAT-PRODUCING AND FATTENING ELEMENTS IN THE FOLLOWING ARTICLES OF FOOD.

	Wheat.	Barley.	Oats.	Maize.	Rye.	Rice.	Peas.	Beans.	Lentils.
Water	14·0	14·0	13·6	14·0	13·0	13·5	14·1	14·8	14·0
Gluten	12·8	12·8	17·0	12·0	10·79	6·5	*Casein.* 23·4	*Casein.* 24·0	*Casein.* 26·0
Albumen	1·8	...		...	3·04	0·0			
Starch	59·7	48·0	39·7	60·0	51·14	74·1	37·0	36·0	35·0
Sugar	5·5	3·8	5·4	0·3	3·74	0·4	2·0	2·0	2·0
Gum	1·7	3·7	3·0		5·31	1·0	9·0	8·5	7·0
Fat	1·2	0·3	5·7	7·7	0·95	0·7	2·0	2·0	2·0
Woody fibre	1·7	13·2	12·6	5·0	10·29	3·3	10·0	9·2	12·5
Mineral or ash	1·6	4·2	3·0	1·0	1·74	0·5	2·5	3·5	1·5
	100·0	100·0	100·0	100.0	100·0	100·0	100·0	100·0	100·0
Flesh-forming elements	14·6	13·0	17·0	12·0	13·8	6·5	23·4	24·0	26·0
Flesh giving and fattening elements	69·8	69·5	66·4	73·0	71·5	79·5	60·0	57·7	58·5

EXPERIMENTS *of the late* LORD SPENCER *and* MR. HILLYARD *on the comparative Feeding Value of Mangolds and Swedes.*

LORD SPENCER'S EXPERIMENT.

Two steers were selected, equally well-bred, weighing 668 lbs. each.

No. 1 was put on swedes and hay, No. 2 on mangolds and hay, on 24th December, 1825.

On the 23rd January, No. 1 had consumed 1624 lbs. of swedes, and weighed 703 lbs.; having increased in weight 35 lbs., or at the rate of 48¼ lbs. for every ton of swedes consumed.

Same date.—No. 2 had consumed 1848 lbs. of mangold, and weighed 721 lbs.; having increased in weight 53 lbs., or at the rate of 65½ lbs. for every ton of mangold consumed.

It having been suggested that No. 2 might have naturally more feeding quality than No. 1, the experiment was reversed, and No. 1 was fed on mangold, and No. 2 on swedes.

On the 20th February, No. 1 had consumed 1884 lbs. of mangolds, and weighed 734 lbs.; having increased in weight 31 lbs., or at the rate of 36¾ lbs. for every ton of mangold consumed.

No. 2 had consumed 1880 lbs. of swedes, and weighed 734 lbs.; having increased in weight 13 lbs., or at the rate of 15½ lbs. for every ton of swedes consumed.

The steers were then both placed on mangolds.

On the 19th March each had consumed 1792 lbs. of mangold.

No. 1 weighed 784 lbs., having increased 50 lbs.

No. 2 weighed 765 lbs., having increased 31 lbs.

Lord Spencer observes: — "It would appear, therefore, as if the natural propensity to feed of No. 1 was greater than that of No. 2 in the proportion of 50 to 31; but notwith-

standing this, in the first month, when No. 1 was on swedes, and No. 2 on mangold, No. 2 beat No. 1 in the proportion of $65\frac{1}{2}$ to $48\frac{1}{4}$. No. 1 was sold for 24*l.* 3*s.*, and No. 2 for 24*l.*"

It seems the weight of hay consumed by each steer was not weighed. Had that been accurately ascertained, the experiment would have been much more satisfactory.

This experiment is immediately followed in the Journal by a very able and interesting letter of Mr. W. Miles, M.P. for Somersetshire, to Mr. Pusey, on the cultivation of mangold, which we recommend to your perusal.

MR. HILLYARD'S EXPERIMENT.

On the 4th January, 1843, Mr. Hillyard put into his stalls six three-year-old Hereford steers, divided as nearly as possible as to weight, frame, and quality; all of the same person's breed. Nos, 1, 2, and 3, were fed on mangolds, and Nos. 4, 5, and 6, on swedes; the following was the result in a tabular form: —

	Estimated Weight.	Dead Weight of Carcass.	Increase of Weight.
No. 1.	74	87·6	13·6
No. 2.	76	92·1	16·1
No. 3.	74	89·3	15·3
	224 stones.	269·2 lbs.	45·2
			Loose fat 25·5
			70·7
No. 4.	76	99·2	23·2
No. 5.	74	85·6	11·6
No. 6.	74	89·7	15·7
	224 stones.	274 7 lbs.	50·7
			Loose fat 24·7
			75·6

This experiment gives five stones in favour of swedes.

The feeding capabilities of animals vary so much, that such a question as this could only be satisfactorily resolved by numerous experiments more accurately performed than either of these.

In the case of Lord Spencer's, an element which might have been material was wanting, viz. the hay consumed simultaneously by each animal. In Mr. Hillyard's, each animal had the same kind and quantity of auxiliary food; but then the actual weight of the several animals when put into the stalls was not ascertained. The *estimated* weight only was given; and when it is borne in mind there were six animals, and the excess of increase is only five stones, it is quite possible that the actual weight at the commencement of the experiment might have materially affected the result. Judgment was evidently at fault in the selection of Nos. 4 and 5; the increase of the one having been more than double that of the other, under the same circumstances in all respects.

ANALYSIS *made by Professor Way, of Box Manure, from Mr. Lawrence's Farm.*

One hundred parts of the manure contained:—

Water	72·33
Organic matter	21·80
Mineral matter in ash . .	5·87
	100·00

An approximative estimation was made of the relation between the straw and the real dung (both being dry), and the result was as follows: straw 41, dung 59, per cent.

The following is the analysis of the ash: —

Soluble silica	27·90
Phosphoric acid	5·11
Sulphuric acid	1·11
Carbonic acid	0·95
Lime	14·41
Magnesia	2·40
Peroxide of iron and alumina	7·81
Potash	11·79
Soda	2·05
Chloride of sodium	3·82
Sand and clay	21·80
	99·15

Examined for nitrogen, the manure gave—

First experiment	0·47	per cent. on the manure in its natural state.
Second ditto	0·45	
Mean	0·46	

This would produce, eventually, 0·56 per cent. of ammonia.

The ammonia, actually existing as such in the manure, was found to be .02 per cent.

The following will be the ingredients of 100 parts of the manure: —

Water	72·330
Organic matter	21·800
Silica	1·637
Phosphoric acid	·299
Sulphuric acid	·065
Lime	·845
Magnesia	·140
Peroxide of iron and alumina	·458
Potash	·692
Soda	·120
Chloride of sodium	·224

Sand and clay	1·279
Carbonic acid	·055
	99·944
Nitrogen in the organic matter . .	·460
Equal to ammonia	·560

The sand and clay, although in large proportion in the *ash*, only exist to the extent of one and a quarter per cent. in the manure itself; the way in which this impurity is introduced will need no explanation.

A striking fact is, the small proportion of *ready-formed* ammonia in the manure, only two parts of fifty-six being in that condition. This circumstance may be taken as conclusive evidence of the very small extent to which fermentation of the materials proceeds in well-constructed boxes.

EXPERIMENT *conducted by* DR. VOELCKER *to ascertain the effect of Exposure on Farm-yard Manure.*

He weighed out, carefully, two cart-loads of a well-mixed sample of farm-yard manure, of which a full analysis is given in his essay. The manure was placed in a heap set against a stone wall, but otherwise exposed to the influence of the weather. This was set up on the 3rd November, 1854, and weighed. It was again weighed, in April and August, in the same year, and again in the following April. Each time it was weighed it was also again analysed, and the results of these weighings and analyses are given in the table on the following page.

TABLE, SHOWING COMPOSITION OF THE WHOLE HEAP (FRESH FARM-YARD MANURE), EXPRESSED IN POUNDS.

	When put up.			
	Nov. 3rd. 1854.	April 30th, 1855.	Aug. 23rd, 1855.	Nov. 15th. 1855.
Weight of manure in lbs. .	2838	2026	1994	197·4
Amount of water in the manure	1877·9	1336·1	1505·3	1466·5
Amount of dry matter in the manure	960·1	689·9	488·7	507·5
Consisting of—				
Soluble organic matters *	70·38	86·51	58·83	54·04
Soluble mineral matters .	43·71	57·88	39·16	36·89
Insoluble organic matters †	731·07	389·74	243·22	214·92
Insoluble mineral matters	114·94	155·77	147·49	201·65
	960·1	689·9	488·7	507·5
* Containing nitrogen. .	4·22	6·07	3·76	3·65
Equal to ammonia . .	5·12	7·37	4·56	4·36
† Containing nitrogen .	14·01	12·07	9·38	9·38
Equal to ammonia . .	17·02	14·65	11·40	11·39
Total amount of nitrogen in manure	18·23	18·14	13·14	13·03
Equal to ammonia . . .	22·14	22·02	15·96	15·75
The manure contains ammonia in free state . .	0·96	0·15	0·20	0·11
The manure contains ammonia in form of salts, easily decomposed by quick lime	2·49	1·71	0·75	0·80
Total amount of organic matters	801·45	476·25	302·05	268·96
Total amount of mineral *matters*	158·15	213·65	186·65	238·54

Dr. Voelcker remarks on this table, "that in the first experimental period the fermentation of the dung, as might have been expected, proceeded most rapidly; but that, notwithstanding, very little nitrogen was dissipated in the form of volatile ammonia; and that, on the whole, the loss which the manure sustained was inconsiderable when compared with the enormous waste to which it was subject in the subsequent warmer and more rainy seasons of the year. Thus we find at the end of April, very nearly the same amount of nitrogen which is contained in the fresh; whereas, at the end of August, 27·9 per cent. of the total amount of nitrogen, or nearly one-third of the nitrogen in the manure, has been wasted in one way or another." He adds that, on the whole, the manure lost 78·2 per cent. of the original quantity of soluble mineral matters, and 77·7 per cent. of the original quantity of insoluble organic matters, and that, at the conclusion of the experiment, more than half the quantity, or, in fresh manure 59·1 per cent. of the nitrogen, in exact numbers, was wasted.

In order to ascertain the waste sustained by manure in ordinary farm-yards, Dr. Voelcker spread a quantity, ascertained to be 1650 lbs., of fresh dung in an open yard, about the usual depth; and ascertained from time to time the weight of this manure and its composition by contemporary analyses. The results of such weighings and analyses are given in the table, p. 96.

Dr. Voelcker explains that in consequence of the great diminution in the bulk, which was progressive, it became necessary to scrape the ground closely, which accounts for the great increase, at the conclusion of the experiment, of the insoluble mineral substances, as compared with that found at the commencement of the experiment.

By substituting the number 66·93, as expressing the proportion of "insoluble mineral matter" which the manure contained at the commencement of the experiment, and which it would also have contained at the end of it, had no earthy matter been mixed up with the manure in the course of the experiments, and adding to that number the other constituents

TABLE, SHOWING COMPOSITION OF ENTIRE MASS OF EXPERIMENTAL FRESH FARMYARD MANURE, *spread* IN ITS NATURAL STATE, EXPRESSED IN POUNDS AND FRACTIONS OF POUNDS.

	When put up.			
	Nov. 3rd, 1854.	April 30th, 1855.	Aug. 23rd, 1855.	Nov 15th, 1855.
Weight of manure in lbs. .	1652 0	1429·0	1012·0	950·0
Amount of water in the manure	1093·0	1143 0	709·3	622·8
Amount of dry matter . .	559·0	285·5	302·7	327·2
Consisting of—				
Soluble organic matters* .	40·97	16·55	4·96	3·95
Soluble mineral matters .	25·43	14·41	6·47	5·52
Insoluble organic matters †	425·67	163·79	106 81	94·45
Insoluble mineral matters .	66·93	90·75	184·46	223·28
	559·00	285·50	302·70	327·20
* Containing nitrogen . .	3·28	1·19	0·60	0·32
Equal to ammonia . . .	3·98	1·44	0·73	0·39
† Containing nitrogen . .	6·21	6·51	3·54	3·56
Equal to ammonia . . .	7·54	7·90	4·29	4·25
Total amount of nitrogen in manure	9·49	7·70	4·14	3·88
Equal to ammonia . . .	11·52	9·34	5 02	4·64
The manure contains ammonia in free state . .	0·55	0·14	0·13	0·0055
The manure contains ammonia in form of salts, easily decomposed by quicklime	1·45	0·62	0·55	0·28
Total amount of organic matters	466·64	180·34	111·77	98·40
Total amount of mineral *matters*	92·36	105.16	190·93	228·80

in the previous analysis of Nov. 1855, the following table of Dr. Voelcker's exhibits the corrected composition of the whole manure in Nov. 1855, in contrast with the analysis of the fresh manure when put up for experiment in Nov. 1854.

	When put up, Nov. 3rd, 1854.	At conclusion of experiment, Nov. 15th, 1855.
	lbs.	lbs.
Weight of the manure	1652·0	950·0
Amount of water in the manure	1093·0	622·8
Amount of dry substances	559·0	170·85
Consisting of—		
Soluble organic matters	40·97	3·95
Soluble mineral matters*	25·43	5·52
Insoluble organic matters†	425·67	94·45
Insoluble mineral matters	66·93	66·93
	559·00	170·85
* Containing nitrogen	3·28	·32
Equal to ammonia	3·98	·39
† Containing nitrogen	6·21	3·56
Equal to ammonia	7·54	4·25
Total amount of nitrogen in manure	9·49	3·88
Equal to ammonia	11·52	4·64
The whole manure contained—		
Ammonia in free state	·55	·0055
Ammonia in form of salts, readily decomposed by quicklime	1·45	·28
Total amount of organic matters	466·64	98·40
Total amount of mineral matters	92·36	72·45

Dr. Voelcker continues: "It will hence appear from these results, that the experiment was begun with 559 lbs. of *dry*

manure; after the lapse of twelve months, only 170·85 lbs. were left behind. Kept for this length of time, spread in an open yard, the manure thus lost no less than 69·8 per cent. in fertilising matter, or, in round numbers, two-thirds of the manure were wasted and only one-third was left behind. This fact teaches a most important lesson, and speaks for itself so forcibly that any further comment appears to me useless."

On Diminishing the Quantity of Roots used in Fattening Cattle.

By CHARLES LAWRENCE.*

THE feeding of bullocks has been of late much discussed in the agricultural journals and elsewhere. It is singular that such a variety of opinion, such a diversity of practice, and so great a difference in expense, should exist at the present day, on a subject of every year's experience, from time immemorial, and that by thousands of agriculturists. Amongst an eminently practical people, as we are reputed to be, it would have been a natural presumption, that the mode and cost of feeding a bullock in the shortest time, and on the most economical plan, would be as well established as any proposition whatever, the only deviation being the time required for the operation; and this would depend on the age, the breed, and the condition of the animal put up. Had this been the occupation of the merchant or manufacturer, instead of the farmer, such a discrepancy would not have existed at this day. Hitherto, exact experiment, carefully noting weight, measure, cost of food, &c., has not been an attribute of the farmer. Such alone will furnish a sound foundation for reliable practice, for which Mr. Lawes has set us an admirable example.

I will presently give some particulars of the feeding of some bullocks last winter; but my immediate object is to repeat a protest I have made from time to time against the prevailing

* *This paper is* extracted from the fifteenth volume of the "Journal *of the Royal Agricultural* Society."

practice of giving to feeding animals a very large quantity of roots daily, and that in a neat state. When I commenced feeding bullocks some years ago, I depended mainly on the experience of others, and was in the habit of noting down the allowances of the different kinds of food recommended in the agricultural periodicals, and otherwise, by men of reputed authority in such matters. The quantity of roots usually recommended, I have observed to be from one to one and a half cwt. per diem, and for large bullocks even up to two cwt., and that without admixture.

Now what is the object we propose to accomplish? It may be assumed for our present purpose, we are dealing with animals at maturity, in point of growth, that the skeleton is fully developed, and that we have only to accumulate flesh and fat. The first consideration would seem to be, what is the food which, at the least cost, contains the largest proportion of those elements which build up muscle and fat, and is at the same time palatable to the animal. General experience points to the various roots grown on the farm, as best fulfilling the latter condition; but when it is borne in mind they contain, on an average, somewhere about eighty-eight per cent. of water, the next point for consideration is, how we can combine with this quantity of fluid as much solid food of an ordinary kind, (whether hay, straw, or chaff,) as may be requisite, having reference to the capacity of the stomach, and that degree of healthy action which is essential to the due assimilation of the more nutritious portions of the food. It must ever be borne in mind, that it is not the *quantity* of food put into the stomach of the animal which accomplishes the object in view, but that which is thoroughly *digested* and *assimilated* by the healthy action of the viscera. When animals are in a state of rest, and consuming food so mixed, I have observed that, with water constantly before them, they take very little, unless the more nutritious food, superadded, be of a heating nature, such as pea or bean meal in too large a proportion: the safest course is to combine crushed linseed with those articles. Such considerations led me to doubt the ex-

pediency of making the chief food of fattening animals *that* nine-tenths of which consist of water, and more especially unmixed with more solid food. The setting before a bullock half a cwt. of neat roots the first thing in the morning, some hours afterwards their allowance of more solid and nutritious food, and repeating the feed of roots in the evening, appeared to me an irrational proceeding; and, on the other hand, that a due admixture of the solid and fluid foods would probably aid the proper digestion of each. I resolved, therefore, to diminish the quantity of roots which I had generally heard recommended, one-half—viz. to from seventy lbs., to eighty lbs. per diem, according to the size of the animal, and to give a portion of these with each feed, as intimately incorporated as might be practicable with the more solid food. With this view I obtained Moody's cutter, now sold by Carson, of Warminster, which cuts the roots into thin ribbons; these we turn over amongst the chaff, so that the animals cannot avoid eating them together.

I have for some time directed the attention of some of the agricultural implement makers to the want of a pulping-machine, in order to effect a still more intimate incorporation of the drier food with the roots, for which a prize has lately been offered by the Royal Agricultural Society. Such an article was produced at Lincoln, by Mr. Phillips, of Downham. This is an effective machine at eleven guineas. It cannot probably be rendered, as at present constructed, at a less cost; but while the cost of Moody's cutter is only 4*l.* 10*s.*, a machine for pulping must be produced at a much less cost than eleven guineas before it will get into the farmers' hands.*

I have observed that the animals under the change to which I have adverted throve faster, and were kept equally clean, with one-third less litter, by weight, than we had found necessary on the former mode of feeding.

In the month of August, 1853, our swedes and mangolds were struck with some kind of blight, or other not very well

* *They* are now produced at 5*l.*

defined malady, which nearly stopped their growth, and we were reduced to the alternatives of selling some of the stock, or putting the whole on short allowance of roots, and we adopted the latter. We limited the bullocks to 50 lbs. weight, and the sheep to 10 lbs. per head per diem. We had plenty of good barley-straw, but the hay was very indifferent, having been exposed, for several weeks, to rain, and put up at last in questionable condition.

I purchased seventeen bullocks, at the October Hereford fair. For the first four weeks they had little else than the barley-straw and bad hay, cut into chaff, with their 50 lbs. of roots. From that time till they were sold they had 6 lbs. of linseed and rape cakes, mixed in equal proportions and boiled, and the soup poured over the chaff, which was then covered over in a slate-tank, until the former was completely absorbed. This destroyed the fungus or mould which had accumulated on the damp hay, and rendered it perfectly sweet, but of course could not restore the nutriment washed out by the rain. The linseed and rape cake together averaged 8*l.* per ton: the cost of this, therefore, was 2*s.* 7½*d.* per head per week. The attendance I put at 6*d.* per head per week (a man and a boy, at 18*s.*, managed in all respects twenty-four bullocks, twenty-four fatting hogs, and the store pigs); the chaff 2*s.* 4*d.* per head per week; the roots (estimated at 10*s.* per ton) 1*s.* 8*d.* Say, for the first four weeks, the cost was 5*s.* per head per week; and for the next thirteen weeks 6*s.* 10*d.*, when the animals were sold. The account stands thus: —

	£	s.	d.	£	s.	d.
17 Bullocks, prime cost				286	17	6
Feeding, four weeks, at 5*s.* . .	17	0	0			
Feeding, thirteen weeks, at 6*s.* 10*d.*	76	0	0			
				93	1	0
				£379	18	6

They were sold for 386*l.* 10*s.*

The credit balance, of 6*l.* 11*s.* 6*d.*, would be absorbed by the engine-power, in cutting the chaff; and the manure represents the straw cut for litter.

The result, I think, shows that bullocks may be fatted, in a reasonable time, at a less cost and with a much less quantity of roots than are usually given, by the mode of feeding adopted, without actual loss. I may observe, too, in reference to this particular case, that though beef during the year 1853 bore a good price, lean stock commanded a much higher proportional price in the market.*

Cirencester, Aug. 9, 1854.

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* In the last fatting season (1858) our bullocks realized a profit of rather more than 3*l.* per head, besides the manure, fed on the same plan.

THE END.

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